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ABSTRACT

Supplementing a television video tape series for environmental understanding, this manual offers a coordinated series of action and information presentations on the need for environmental change. Designed to present realities of action that man may take anywhere in the world to help preserve the limited resources of this planet, the series has drawn on the thoughts and advice of many concerned ecologists and economic specialists. Numerous aspects of individual, corporate, and governmental impact on the quality of the total environment are examined. Focusing on man as a part of the environment rather than apart from it, the emphasis is on the environmental impact, good and bad, of man's interaction with nature and what the cost is, whether it be pollution, trade-off, or benefit. Twenty-two units have been developed to consider these environmental problems, solutions, and evaluations. Each unit begins with a perspective of the problem or situation followed by a summary of the broadcast information. To encourage personal action and involvement, many suggestions are given in a section entitled "What can I do?" Completing each unit are listings of books, articles, films, and organizations as sources for further information. This publication is an expanded version of ED 068 338. (JR)

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A TELEVISION VIDEO TAPE SERIES FOR
ENVIRONMENTAL UNDERSTANDING

AN ACTION GUIDE
WRITTEN BY
OSBORN SEGERBERG, JR.

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, N. Y. 12224

OFFICE OF CULTURAL EDUCATION
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A TELEVISION VIDEO TAPE SERIES FOR
ENVIRONMENTAL UNDERSTANDING

This Guide Prepared for and Printed by
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IN COOPERATION WITH
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AUTHORITY,
T.R. IDE, CHAIRMAN

THE UNIVERSITY OF THE STATE OF NEW YORK

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ACKNOWLEDGMENTS

"Man Builds - Man Destroys" was conceived as a series of action and information presentations on the need for environmental change. Designed to present realities of action that men may take anywhere in the world, to help preserve the limited resources of this planet, the series has drawn on the thought, the well-intentioned advice, and the dedication of many of the world's concerned ecologists.

It would not be possible to give recognition to all those who have dedicated professional thought and personal effort to the series, thus far. As usual in any media effort at the United Nations, Michael Hayward, Chief of Visual Services, is the organizational focus for this massive production effort. For excellent administration of the production of the series, we are indebted to Peter Hollander who was and continues to be the Executive Producer.

The initial content planning and delineation of focused approach was a major contribution from three leading scientists of the New York State Museum and Science Service: the late D. L. Collins, State entomologist, and chief scientist, Biological Survey; E. M. Reilly, Jr., senior scientist, zoology; and James F. Davis, State geologist, and chief scientist.

To the many experts on environmental need who so willingly appear and lend their thought and effort to enlarging the understanding of all of us, we give special thanks. As is always his custom, William J. Hetzer, associate in Educational Television for the New York State Education Department, has ably seen to much of the finite detail which has made the distribution of this series a possibility.

Bernarr Cooper
Chief
Bureau of Mass Communications

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Osborn Segerberg, Jr.
Claire Taplin

Preface

The realization of man's total involvement with the biosphere, his love-hate relationship with the natural environment is a concept which, in less than a decade, has experienced a quantum jump from total unawareness and lack of concern to a state of individual nail biting, national debate (sometimes querulous), and restrictive legislation, and now international parleys and agreements. With little or no population control on a worldwide basis, we have learned that what appeared to be isolated instances or localized phenomena of specialized pollution have coalesced into a total degradation of global ecosystems - an accumulation of abuse which must be reversed if we are to survive. The shock of this realization has brought forth a mixed bag of reactions, mostly disorganized and nonconstructive. These range from the wry cynicism of the natural scientists, who saw this situation developing, but whose warnings were ignored so long as they applied to birds or marshes or water tables, to the hysterical frenzy of the environmental demagogue, the purveyor of misinformation and overreaction. Doomsaying is as ineffectual for the total good as was the previous indifference.

Environmental education is the means by which lay citizens can learn the fundamental truths of the Man/Nature interdependence, what has happened to throw this out of balance, and what can rationally be done to cope with the situation - or correct it. It also leads to a greater appreciation of the wonders of the natural system, of which man is only a part. A citizen sophisticated about the environment can weigh and balance, supporting measures which are for the good of his community, his region, his world, and rejecting those which are hasty, ill-considered, or actually counterproductive to the well-being of man in the current life style to which his particular culture and economy have brought him. This leads to the further realization that one nation's freedom of action may work to the environmental detriment of another nation, and that drastic corrective measures taken by one developed nation may be completely unsuitable for a developing nation which has neither the money nor the skilled technology to act other than in its own desperate self-interest. This was the crux of the recent Stockholm Conference on the environment. A worldwide cooperative effort is required - the haves must help the have nots, economically and technologically, on behalf of a viable global existence.

This series of video tapes, "Man Builds - Man Destroys," is a contribution to environmental education. With examples drawn from across the world, filmed on location, and with the cooperation of knowledgeable experts in the complex of environmental and economic specialties, practically every aspect of individual, corporate, and governmental impact on the quality of the total environment is examined. The emphasis is on the environmental impact, good and bad, of man's interaction with nature and what the cost is, whether it be pollution, "trade off," or benefit. This series assumes the viewer to be thoughtful, perceptive, and open minded - a viewer truly receptive to complete environmental education.

In my opinion, this is the most informative and balanced video presentation of environmental problems, solutions, and evaluations which has yet been produced for general use. When viewed with the guidance of Osborn Segerberg's perceptive guidebook, this series makes an outstanding and unbiased contribution to man's understanding of his place and role on this "Blue Planet."

John G. Broughton
Associate Commissioner
for Cultural Education

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INTRODUCTION

Three observers regard an object. One, standing at point A, sees a triangle. A second, from point B, sees a circle. The third, at position C, correctly perceives a cone. The one difference among these observers is perspective.

Even without changing physical position, we have been able to change our perspective by standing on the shoulders of those who have gone before us. At one time, men assumed that the earth was the center of the universe. With this frame of reference astronomers never could explain satisfactorily the movements of all heavenly spheres. When Copernicus offered the correct perspective, the stars and planets took their proper places and men embarked on the long journey that ended with the step of astronaut Neil Armstrong on the moon.

As long as men have walked the earth, they looked at their world to determine their place in the scheme of things, and acted accordingly. MAN BUILDS -- MAN DESTROYS, a coordinated series of television broadcasts, is based upon a new ecological perspective, a new way of looking at things and at ourselves.

Traditionally, we think of the individual as a separate entity, the ultimate unit. Our laws, the way we act are based on that belief. But ecology, the science of relationships, has observed that an individual lives not in isolation, but in context with his environment. He exists within a group of his own kind -- a population. For us, the population could be the people in our town or our fellow countrymen or the entire species, the world population. It is clear enough that even though we may drive our car alone, we must take into account the behavior of fellow motorists, follow instructions of police officers, and rely on the supplies of the gas station attendant. The loner is influenced by words written by his fellow humans while even the dedicated solitary cannot avoid the tax collector.

Individuals interact also with members of other species in what ecologists call a community. We may like to think that we exist separately from all other creatures, but mosquitoes dine on us, microorganisms inhabit us, and we would starve without populations of cows, chickens, cod, corn, apple trees, and on and on. We would use up our oxygen without green plants and the phytoplankton of the sea. A humble bacterium plays a vital role in recycling essential nitrogen. The living community is inter-related with such complexity that we don't even know how many kinds of organisms we may depend upon for survival.

This skein of life coexists with its physical surroundings in a totality known as an ecosystem. On a limited scale, an ecosystem might be a pond, a watershed, or a desert. The largest ecosystem we know -- the whole world -- is the biosphere. The interacting within this ecological system is pervasive and never-ending. If through ignorance or carelessness we cast harmful substances into our surroundings, we later make the uncomfortable discoveries of DDT in our fat, lead in our blood, strontium-90 in our bones, mercury in our tissues, asbestos in our lungs. Indeed, the normal carbon, hydrogen, calcium, phosphorous atoms that compose our bodies will return another day to the inanimate part of the continuum. And we see that the Biblical saying of "for dust thou art, and unto dust shalt thou return" is an ecological truth.

It is common to think of physical environments affecting life in a one-way affair -- lush exuberance in the tropics, harsh struggle to survive in the desert. But influences go the other way, too. Man with improvidence has created deserts and, with care, gardens. The interactions persist and permeate like widening circles from pebbles ceaselessly dropped into water. If a section of a city is allowed to deteriorate without repair, eventually it affects all the city's residents. Some seek improvement, some move away, some accept the change. If the seekers of improvement fail, then physical conditions worsen, with further adverse effects upon people. At the end of this cybernetic process are elume and despair. Winston Churchill wisely remarked, "We shape our buildings, and afterwards our buildings shape us," which means the process can go either way.

So our environment is made up of fellow humans, other living things, the physical materials of our air, land, and water. Not only is the individual inextricably bound up with his environment, he is defined by his relations with it. Recognition of the truth of this situation is forcing us to rescind one of our basic viewpoints. It is not man apart, but the opposite: man a part of.

This shift in focus provides a way to judge the proposals of self-proclaimed benefactors of mankind. Since our welfare is intimately related to our environment, the test of any new alteration is: if it's good for the biosphere, it's good for us. If it is harmful for the biosphere, then at some point it will hurt us. While the rule is simply stated, actual cases can be obscure or complicated, as some of the broadcasts demonstrate. We need energy to run our civilization, but environmental damage occurs in securing most of that energy. Should we give up the energy, curtail it, try new methods? Often, we are forced to think about trade-offs, choices between the lesser of two evils or greater of two goods. And always we must strive to divine all the effects of a new policy or program. Only when we are able to assess all the consequences of all our actions will we be able to foresee our future.

This series is rooted in the faith that Homo sapiens -- intelligent man, we have proudly called ourselves -- will act according to his best interests if the course is clearly shown. Not only that we will act, but that we can act -- for we are the crucial actors, the caretakers of all life on earth. The series, then, is an article of optimism that we can manage our destiny, live in harmony with our surroundings and ourselves. It is built on the belief that, just as a long journey begins with a first step, great changes begin with one person: you.

For further information

Books

1. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., 1971, \$6.95 or EVERYBODY'S ECOLOGY by Clay Schoenfeld; A. S. Barnes, Cranbury, N.J., 1971, \$7.95. The second chapter of Dr. Commoner's book and the first chapter of the latter book are concise summaries of the main points of ecology.
2. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER AND AIR GONE? by Osborn Segerberg, Jr.; David McKay, N.Y., 1971, \$2.95. A more complete account of ecology for the general reader.
3. FUNDAMENTALS OF ECOLOGY by Eugene Odum; W. B. Saunders, Philadelphia, \$11.75. The ecologists' book on ecology.
4. ECOLOGY by Eugene Odum; Holt, Rinehart and Winston; N.Y., 1963, \$3.25. A shorter version with somewhat different emphasis.
5. ECOLOGY AND FIELD BIOLOGY by R. L. Smith; Harper & Row, N.Y., 1966, \$15 (New edition January 1972). A basic university textbook.
6. THE FOREST AND THE SEA by Marston Bates; Signet, N.Y., 1960, 60¢. One of the best introductions to ecological principles.
7. THE BIOSPHERE, A Scientific American Book; W. H. Freeman, San Francisco, 1970. Incorporating 11 articles on various aspects of the subject. Also in SCIENTIFIC AMERICAN, September 1970.

8. A SAND COUNTY ALMANAC by Aldo Leopold; Oxford, N.Y., \$6.50.
Wise, eloquent insights into the science of nature.
9. WALDEN by Henry Thoreau. Ecological awareness before the
science was defined.
10. THE SUBVERSIVE SCIENCE edited by Paul Shepard and Daniel
McKinley; Houghton Mifflin, Boston, 1969, \$5.95.
Essays toward an ecology of man.
11. SO HUMAN AN ANIMAL by Rene Dubos; Scribners, N.Y., 1968,
\$2.45. On man's relation to his environment.
12. ENVIRONMENTAL QUALITY, an annual report on the environmental
state of the United States, published by the Council
on Environmental Quality in August. The first one
appeared in 1970. \$2. U.S. Government Printing Office.

Publications

1. SCIENCE
American Association for the Advancement of Science
1515 Massachusetts Ave., NW
Washington, D.C. 20005
2. ENVIRONMENT
Committee for Environmental Information
438 North Skinker Blvd.
St. Louis, Mo. 63130
3. BIOSCIENCE
American Institute of Biological Sciences
3900 Wisconsin Ave., NW
Washington, D.C. 20016
4. SCIENTIFIC AMERICAN
415 Madison Ave.
New York, N.Y. 10017
5. THE CONSERVATIONIST
New York State Department of Environmental Conservation
Albany, N.Y.
6. AUDUBON
National Audubon Society
1130 Fifth Avenue
New York, N.Y. 10028

7. ENVIRONMENTAL SCIENCE & TECHNOLOGY
American Chemical Society
1155 16th St., NW
Washington, D.C. 20036
8. NATURAL HISTORY
The American Museum of Natural History
Central Park West at 79th St.
New York, N.Y. 10024
9. NOT MAN APART
Friends of the Earth
529 Commerical St.
San Francisco, Calif. 94111
10. CF LETTER
The Conservation Foundation
1717 Massachusetts Ave., NW
Washington, D.C. 20036
11. OUR DAILY PLANET
Mayor's Council on the Environment
51 Chambers St.
Room 223
New York, N.Y. 10007
12. Publications also issued by National Wildlife Federation,
The Wilderness Society, Sierra Club, Environmental
Defense Fund, Natural Resources Defense Council.

Films*

1. THE WORLD AROUND US, 25 min., color, Contemporary Films/
McGraw-Hill, \$325, rental \$18. An introduction to the
science of ecology produced by NBC-Smithsonian
Institution.
2. WHAT IS ECOLOGY?, 11 min., Encyclopedia Britannica Educational
Corporation, color \$135, b&w \$70. Illustrates inter-
relationships between plants, animals, and their environ-
ment, introducing world's major ecosystems.
3. NO DEPOSIT -- NO RETURN, 10 min., Centron Educational Films,
\$150, rental \$15, grades 4-adult. A poetic interpretation
of the condition of the land and the lives of the people
who live on it, contrasting many different environments.

*Addresses of film distributors are given at the end of this guide.

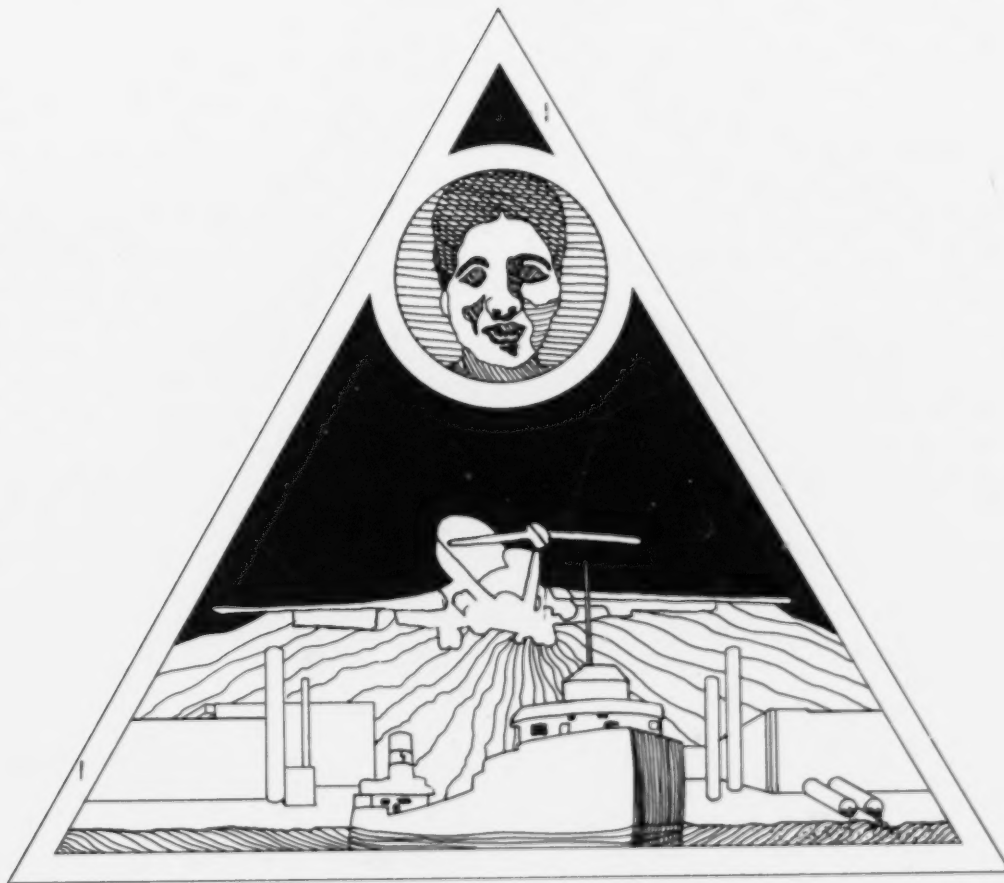
4. CAVE ECOLOGY, 15 min., Centrol Educational Films, \$175, rental \$17.50, grades 1-9. The cave community serves as a comparison to larger communities, explaining such basic concepts as food chains, food webs, prey-predator relationships, and adaptation.
5. THE COMMUNITY, 11 min., Encyclopedia Britannica Educational Corporation, color \$135, b&w \$70. Introduces concept of ecological community, showing interrelationships among a group of plants and animals adapted to the same general physical conditions.
6. THE LIVING EARTH, 10 min., Pyramid, \$120, rental \$10, grades 1-adult. Emphasizes interdependence of all living things and wonder of the world.
7. ECOLOGY -- CHECKS AND BALANCES, 14 min., Pyramid, \$175, rental \$15, grades 4-12. Explores the interrelationships between the ladybird beetle and the aphid to illustrate one of nature's checks and balances.
8. THEY LIVE BY WATER, 26 min., color, University of California, rental \$19. The film explores step by step the web of life in a freshwater pond.
9. THE CHAIN OF LIFE, 30 min., color, Indiana University, \$315, rental \$11.50. Man, as an end-link in the chain, limits his own survival when he destroys other links. Produced by National Educational Television.
10. WHAT ECOLOGISTS DO, 16 min., Centrol Educational Films, \$210, rental \$21, grades 4-12. The film defines ecology and describes what ecologists do.
11. MEN AT BAY, 26 min., King Screen Productions, \$350, rental \$35, grades 1-adult. Film uses threatened San Francisco Bay to bring out ecological awareness.
12. ENVIRONMENT, 29 min., BFA Educational Media, \$370, rental \$25, grades 7-adult. A film about degradation of our living environment, raising question of what balance can be achieved between the present level of technology and life-style and a quality environment.
13. THE CHANGING FOREST, 19 min., color, Contemporary Films/McGraw-Hill, \$245, rental \$15. An essay of the ecology of a deciduous forest.
14. SILENT SPRING OF RACHEL CARSON, 54 min., b&w, Contemporary Films/McGraw-Hill, \$275, rental \$15. A CBS Reports documentary on the landmark controversy between the pioneering biologist and the chemical pesticides industry.

15. WHAT ARE WE DOING TO OUR WORLD, Parts I and II each are 27 min., color, Contemporary Films/McGraw-Hill, \$350, rental \$18. An inventory of threats to the environment produced by CBS for the 21st Century.
16. THE ARK, 20 min., Arthur Barr Productions, \$250, rental \$20, grades 4-college. Presents concept of ecosystem and the effect of pollution.
17. ECOLOGY -- OLYMPIC RAIN FOREST, 20 min., International Film Bureau, \$250, rental \$12.50, grades 7-adult. Describes significance of the rain forest, illustrating roles of decomposers and scavengers.
18. TREEHOUSE, 9 min., King Screen Productions, \$140, rental \$15, grades 1-9. Introduces the relationship of man and his culture to his environment and the proper use of natural resources.
19. ECOLOGY PROBE -- PLANET EARTH, 10 min., Fordham Publishing Company, rental \$45, grades 4-12. Visitors from outer space investigate earth's environment, dismiss planet as unfit for settlement.

Organizations

1. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20036
2. Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
3. Conference on the Human Environment
United Nations, N.Y. 10017
4. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
5. The Ecological Society of America
Frank McCormick, Secretary
Department of Botany
University of North Carolina
Chapel Hill, N.C. 27514
6. New York State Museum and Science Service
State Education Bldg.
Albany, N.Y. 12224

**IT
CAN BE
DONE**



9/10

IT CAN BE DONE

Perspective

A myriad of environmental-ecological-resource-population problems burst upon human consciousness in the 1960's. The sudden discoveries of long-lasting radiation poisoning in the atmosphere, long-lived pesticides in the oceans, along with oil, mercury, PCB's (polychlorinated biphenyls), and a host of other chemicals; the land of industrialized countries coated with concrete and autos choking the highways, copper, helium, and other resources becoming short in supply; such newly valued resources as space or quiet began disappearing along with whales and tigers as people and technology permeated the planet.

As signs of the strains of our modern civilization upon natural systems became unmistakable even to the untrained layman, scientists focused powerful instruments of measurement upon these dislocations. In some cases, they documented in precise fashion what at first had been only suspicions. The results of all this attention were alarm, accusations, denials, controversy, impasse, inertia. The second wave of human reaction was heightened concern, redoubled charges provoking recalcitrance, producing dire forecasts, "Silent Spring," DOOMSDAY.

As these attitudes gained acceptance -- as the chorus of foreboding swelled -- it became easy to believe that the problems were overwhelming, out of control, beyond remedy. This attitude leads to hand-wringing and feelings of helplessness, paralysis. A precondition of effective action is faith or confidence; we can act effectively only when we believe we can.

The documentary, IT CAN BE DONE, is a basic theme of the MAN BUILDS -- MAN DESTROYS series. It reflects the already-evident grassroots response to the environmental crisis. It represents the emerging reforms of abuses: mobilization of citizens' groups, growth of environmental law, publication of a sizable body of literature, major attention from newspapers and magazines, new attempts by industry to do things in different ways, stricter municipal, state, and Federal ordinances; realignment of government in order to deal more effectively with environmental problems; the United Nations Stockholm Conference on the Human Environment.

Above all, this theme emphasizes the important role of the individual in meeting this challenge.

The Broadcast: IT CAN BE DONE

The documentary deals with three separate situations -- excessive noise in Manhattan, mercury poisoning at Minamata, Japan, and the practice of spraying DDT in a campaign against gypsy moths in Connecticut.

In New York City, Robert Alex Baron launched a one-man crusade against noise pollution. He gave up a career in the theater to found a group called Citizens for a Quieter City and wrote a book, The Tyranny of Noise. His action was virtually a matter of self-preservation. Jackhammers drilled outside his home in midtown Manhattan every weekday for more than 2 years. Although the noise was mind shattering, there was nothing wrong with it, legally.

Among the points made by Baron and his crusade is that even a citizen in a giant metropolis need not be overwhelmed by environmental problems. He can do something about the stimuli that bombard him. Baron showed that noise -- unwanted sound without message -- can be dealt with in several ways. One is that it is quite possible to make quieter machines...if offended people will demand them. Another is through political and governmental remedy. Baron fought for a "Task Force on Noise" which, in turn, helped establish a city Bureau of Noise Abatement. Then New York City became a municipal pioneer by proposing a Noise Abatement Code to establish a legal apparatus for noise control.

In Minamata, Japan's first chemical fertilizer plant dumped its waste into the nearest body of water, Minamata Bay. Among these wastes was mercury which, in a tragic parody of the Biblical advice of "casting bread upon the waters," came back to the people of Minamata via the biological food chain. The mercury and its compounds was ingested by tiny marine organisms which were eaten by small fish and crustaceans which, in turn, were eaten by larger fish. The tainted fish poisoned at least 180 local people, causing 52 deaths.

Many residents in Minamata felt that the company should indemnify the victims and their families, but the firm disclaimed any responsibility, so the protestors bought single shares of stock in the company and attended a stockholders' meeting, intending to present their case. However, the agenda, enforced by 3,000 special guards, bypassed the issue.

Just when it seemed the protestors had no recourse, their leaders struck upon a novel strategy. They organized a demonstration outside the fertilizer plant by Buddhist monks who chanted hymns and put spiritual curses on the owners of the plant.

This kind of publicity was not good for business, and company officials capitulated, agreeing to make restitution to victims of the mercury poisoning and their families.

The third story involves a plague of gypsy moths in the early 1960's. The moths devastated foliage in the normally beautiful woods of western Connecticut. The immediate reaction of the citizenry, and the state, was to fight the insects with the miracle chemical of World War II, DDT. A few residents of Cornwall in the northwestern part of the state, aroused by the message against indiscriminate use of persistent pesticides in Rachel Carson's book, Silent Spring, opposed aerial spraying of DDT, and lost.

But initial defeat provided the means for a much larger victory. These opponents of spraying retained a chemist. Together they conducted an investigation showing how aerial DDT drifted as much as 7 miles from target areas. Even when sprayers aimed only at infected places, the result was widespread contamination, leading to such undesirable "side effects" as the condemnation of poisoned milk.

The final report compiled by the Cornwall group was submitted to the state legislature, with the final result that aerial spraying of DDT was banned in Connecticut in February 1965, an example gradually followed by the Nation.

What can I do?

While the circumstances in each of the three stories appear to be quite different, there is a common theme. In each instance, the initiators formed groups uniting people who desired similar ends. Saul Alinsky, very experienced in shaping effective citizen action, has written: "Change comes from power, and power comes from organization. In order to act, people must get together. Power is the reason for being of organizations."

As we have seen, the status quo is difficult to change. Not only is there inertia, but industries and special interest groups have formed just such organizations -- lobbies and trade groups -- in order that their positions may prevail with lawmakers. A good number of environmental organizations exist; as they gain members their strength increases.

So to begin with, you can give your support to a number of national organizations that have played an important role in defending the environment. Not only would you be helping them, but in most cases your contribution is tax deductible since they are nonprofit groups. More than that, their activities may contribute to your own life and well being.

Herewith are some of these organizations (complete names and addresses are in the next section): the Sierra Club has been in the forefront of the conservation fight; Friends of the Earth, the same; The Wilderness Society, like the Sierra Club offers backpack, horsepack wilderness hikes; the National Audubon Society publishes possibly the most beautifully produced magazine in the United States; The Conservationist Magazine, published by the New York State Environmental Conservation Department in Albany, is another well produced magazine. The Izaak Walton League and National Wildlife Federation are two other leading conservation organizations, the latter offering still another outstanding magazine.

As of June 1, 1971, the five largest environmental organizations -- National Wildlife Federation, National Audubon Society, Sierra Club, Izaak Walton League of America, and The Wilderness Society -- counted 1.6 million members, an increase of almost 33 percent over the year before. These and other environmental groups -- there are estimated to be some 3,100 of them in the United States -- are beginning to exert political leverage, exemplified by the defeat of the SST program. The Conservation Directory, published by the National Wildlife Federation, lists more than 250 national and regional environmental organizations and nearly 400 State groups.

Natural Resources Defense Council and the Environmental Defense Fund are two environmental legal action organizations, and the Sierra Club also has a legal arm. The Center for Responsive Law, Ralph Nader's group, includes consumer affairs and corporate conduct along with its environmental interests, and emphasizes public investigations as its modus operandi. The Conservation Foundation acts as a philosophic arm of the movement, sponsoring conferences and studies on specific problems; the Nature Conservancy buys endangered land and holds it until it can be turned into park land; World Wildlife Fund works on behalf of endangered animal species; Scientists' Institute for Public Information offers scientific facts about environmental problems (the local New York City group, which sponsors a number of investigative, task force committees, is Scientists' Committee for Public Information); also in New York City, Citizens for a Quieter City fights against noise, and Citizens for Clean Air against air pollution.

Many of these groups can use and would welcome volunteer help.

In addition to national organizations, ad hoc groups have been organized to achieve one particular goal. In mid-1971, it was estimated there were upwards of 2,500 local groups -- in addition to civic, church, school groups, and local chapters of national organizations -- striving to improve the environment of their communities. Perhaps the best known of such

groups is Scenic Hudson Preservation Conference, founded in 1963 to prevent Consolidated Edison Company from gutting Storm King Mountain in order to build a pumped storage power plant. Until this time, electric power companies, with approval of the Federal Power Commission or other regulatory agencies, had almost always been able to build new plants wherever they wished. A long, costly legal struggle delayed Con Edison's intended program, forced the FPC to reconsider such siting with a view toward its environmental impact, and set a crucial new legal precedent when a U.S. Court of Appeals ruled that the role of environment must be considered in power plant siting.

In New Jersey, another group of local citizens prevented the Port of New York Authority from building a fourth jetport in one of the metropolitan area's last patches of wilderness, The Great Swamp. Instructed by such examples, groups of citizens in many places have organized to achieve a single objective. If you contemplate a lawsuit, you can get advice and possibly other legal help from Natural Resources Defense Council and/or Environmental Defense Fund.

In addition to being a group member, you can also act as an individual. And whether acting in either capacity, heed these general rules: be informed, keep informed, study in depth the problems you wish to tackle. Effective action is based on complete and correct information. Patience and persistence are required in effecting environmental changes. Good intentions must be backed by tenacity. Know the power structures of your community, state, and Nation. Learn how to maneuver through them (see Publications).

It can be done, it really can. They laughed when Ed Koupal of San Diego gave up his job as a used car salesman to become a citizen activist, but now Koupal heads the California People's Lobby, which is seriously bidding to get the toughest antipollution controls in the country on to the state statute books. In 1963, Greenport, Long Island, harbor was closed to clam digging. It was too polluted; but the clamming was resumed 8 years later, thanks to an antipollution campaign waged equally by local officials, clam diggers, and private citizens. In Montreal, three young residents scrounged through refuse heaps for discarded bottles; then with cutters, tappers, and imagination went into business selling goblets, lamps, jewelry, punch bowl sets, candleholders, turning "waste" into raw material.

In Manhattan, a woman who had been watching from her apartment window reported a company dumping waste concrete into the East River. She precipitated Federal court action under the 1899 Refuse Law (you are entitled and encouraged to report

water polluters to your nearest United States attorney under this law; it is explained more fully in the What can I do? section of FLOW GENTLY). The company was found guilty and fined \$25,000; the lady was awarded half the fine as her share, as the law prescribes -- \$12,500.

There is one other environmental law with which you should be familiar. This is the National Environmental Policy Act (NEPA). This law says that the Federal Government shall try to promote harmony between man and his environment and specifically directs that any proposed legislation or action by any Federal agency must be assessed as to its environmental impact. If there is any significant impact upon environment, then alternative and less harmful approaches must be considered.

Your vote can be one of the effective instruments of environmental reform. Judge candidates on their environmental records or lack of them. The League of Conservation Voters will supply you with a list of how all senators and congressmen voted on key environmental legislation. Question candidates on how they stand on environmental issues. Work for an environmentally aware candidate. Always vote.

Another way elected officials are influenced is by letting them know how you feel about a certain issue. Write to your congressman, your senator, your state and local officials. They do listen if enough people speak.

It also helps to write to the proper person, the correct committee. Your own congressman and two senators are your personal representatives, of course, but certain other lawmakers are by assignment concerned with particular areas of interest. Here are key committees and subgroups in the United States Congress dealing with environmental matters:

Senate: Agriculture and Forestry

Commerce Subcommittee on Energy, Natural Resources,
and the Environment

Government Operations Subcommittee on Intergovern-
mental Relations

Interior and Insular Affairs

Labor and Public Welfare Subcommittee on Health

Public Works Subcommittee on Air and Water Pollution

House: Agriculture

Government Operations Subcommittee on Conservation
and Natural Resources

Interior and Insular Affairs

Interstate and Foreign Commerce

Merchant Marine and Fisheries Subcommittee on
Fisheries and Wildlife Conservation

Merchant Marine and Fisheries Subcommittee on
Oceanography

Public Works Subcommittee on Rivers and Harbors

Public Works Subcommittee on Flood Control

The Joint House-Senate Committee on Atomic Energy

Find out from your current Congressional Directory who are the chairmen and members of these groups. Write to the chairman; perhaps a committee member is one of your representatives. Follow the same procedure for your state legislature and city council.

A third way of influencing lawmakers is through lobbying, this, in effect, is the job of many of the national groups mentioned above. The Environmental Planning Lobby concentrates on New York State legislation.

Finally, you can influence other people for the environmental cause by personal example. Perhaps cleanliness has been placed next to Godliness because it is so difficult to achieve, but we can aspire to it. We can try. It takes application in order to become environmentally aware and in order to evaluate recommended courses of action. It takes understanding to make correct personal decisions and to behave in an environmentally exemplary way.

For further information

Books

1. THE ENVIRONMENTAL HANDBOOK edited by Garrett de Bell;
Ballantine/Friends of the Earth, N.Y., 1970, 95¢.
Prepared for the first Earth environmental teach-in.

2. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, \$6.95. Title tells it all.
3. IF YOU WANT TO SAVE YOUR ENVIRONMENT...START AT HOME! by Carroll Harrington, et al.; Hawthorn, N.Y., 1970, \$2.50. Prepared under the aegis of The Women's League of Voters, this pocket-size book contains lists of do's and don'ts.
4. ECOTACTICS by John G. Mitchell and C.S. Stallings; Pocket Books, 1970, 95c. Under the Sierra Club aegis, what people can do to save the environment.
5. ECOTAGE by Sam Love and David Obst; Pocket Books, 1972, \$1.25. Environmental action for activists.
6. EARTHKEEPING by Gordon Harrison; Houghton Mifflin, Boston, 1971, \$5.95. A thoughtful explication of the environmental tangle and the indispensable role of the individual in straightening it out.
7. EARTH TOOL KIT, Pocket Books, 1971, \$1.25. A field manual for those who want to do something about environmental destruction. SCHOLASTIC TEACHER Magazine says, "Multiple copies are recommended for schools with environmental studies as part of the curriculum."
8. THE LAST WHOLE EARTH CATALOGUE, Portola, 1971, \$5. Where to get what tools.
9. USER'S GUIDE TO THE PROTECTION OF THE ENVIRONMENT, Friends of the Earth/Ballantine, 1970, \$1.25. A long list of what -- and what not -- to buy to help the environment.
10. OUR ENVIRONMENT CAN BE SAVED by Nelson A. Rockefeller; Doubleday, Garden City, N.Y., 1970, \$2.50. A review of New York State programs.
11. DEFENDING THE ENVIRONMENT by Joseph Sax; Knopf, N.Y., 1971, \$6.95. By the expert on environmental law on what citizens can do.
12. TEACHING FOR SURVIVAL by Mark Terry; Friends of the Earth/Ballantine, 1971, \$1.25. Recommended by SCHOLASTIC TEACHER Magazine.
13. DISASTER BY DEFAULT by Frank Graham, Jr., Curtiss, 1966, 75c. What happens when citizens don't care or do nothing.

14. THE TYRANNY OF NOISE by Robert Alex Baron; St. Martin's, N.Y., 1970, \$7.50. All about noise pollution and what you can do about it.
15. NOISE POLLUTION by Charles Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, \$1.68. For students (grades 7-9) with experiments. There's also a teacher's edition.
16. CONGRESSIONAL DIRECTORY, U.S. Government Printing Office, Washington, D.C., paperback \$3.
17. THE ENVIRONMENT, THE ESTABLISHMENT AND THE LAW by Henkin, Mertz and Staples; Houghton Mifflin, Boston, 1971, \$2. Legal and legislative hearings on environmental problems.
18. CAREER EDUCATION IN THE ENVIRONMENT, A HANDBOOK. U.S. Government Printing Office, Washington, D.C. 20402, \$3. Designed for secondary schools to give information on career opportunities.
19. ENVIRONMENTAL -- ECOLOGICAL EDUCATION: A BIBLIOGRAPHY OF FICTION, NONFICTION, AND TEXT BOOKS FOR ELEMENTARY AND SECONDARY SCHOOLS. U.S. Government Printing Office, Washington, D.C. 20402, 40¢.

Magazines

1. SCHOLASTIC TEACHER Junior/Senior High Teacher's Edition, 50 West 44th St., New York, N.Y. 10036, has provided a "Teacher's Survival Guide to Environmental Education Resources" in its October 1971, edition. The guide recommends new teaching materials in multimedia, paperbacks, films, and booklets.

Articles

1. "On the Shores of Lake Michigan, Citizens Fight a Wide Range of Tactics to Protect the Environment" -- CONSERVATION FOUNDATION LETTER, September 1971, The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036. On citizens' action groups.
2. "The Gypsy Moth" by A. Dexter Hinckley, ENVIRONMENT, March 1972.

3. "Noise in the Environment" by Peter Franken and Daniel Page; ENVIRONMENTAL SCIENCE AND TECHNOLOGY, February 1972.
4. "A Guide to the New York City Noise Control Code," New York City Environmental Protection Administration.

Publications

(See also Publications for introductory section)

1. HELP, a useful list of do's, don'ts, and sources of information in the environmental course. Help, Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201.
2. MUNICIPAL ADVISORY COUNCILS FOR ENVIRONMENTAL CONSERVATION, a state guide and bibliography for organizing local environmental action units. New York State Office for Local Government, 155 Washington Ave., Albany, N.Y. 12201.
3. COMMUNITY ACTION FOR ENVIRONMENTAL QUALITY, U.S. Government Printing Office, Washington, D.C. 20402.
4. GETTING SOMETHING DONE issued by The League of Women Voters Educational Fund, 1730 M St., NW, Washington, D.C. 20036. 15¢.
5. THE CONSERVATION DIRECTORY published annually by the National Wildlife Federation (see Organizations). A complete listing of environmental groups. \$1.50.
6. ENVIRONMENTAL EDUCATION 1970, a workbook published by Scientists' Institute for Public Information (see Organizations), listing university courses on ecology and the environment. More courses have been added since 1970 and a personal check of the college of your choice would be worthwhile.
7. TOWARD A QUIETER CITY, A Report of the Mayor's Task Force on Noise Control, New York City, 1970.
8. ENVIRONMENTAL QUALITY, the Annual Report of the Council on Environmental Quality on the state of the Nation. U.S. Government Printing Office, Washington, D.C. 20402.
9. ALL AROUND YOU, AN ENVIRONMENTAL STUDY GUIDE, U.S. Department of Interior, 1971, U.S. Government Printing Office, Washington, D.C. 20402, \$1.50.

Films*

1. OUR POISONED WORLD -- WATER, 30 min., Time-Life Films, \$350, rental \$30, grades 4-adult. For groups studying water pollution, the film emphasizes citizen action growing from indignation.
2. A SEARCH FOR ECOLOGICAL BALANCE, 38 min., Film Images, \$360, rental \$25, grades 7-adult. With views of ecologist Eugene Odum, film shows how man can alter the environment through carelessness and lack of concern, and presents a list of specific ways people can become involved with environmental conservation.
3. POPULATION AND POLLUTION, 17 min., International Film Bureau, \$225, rental \$12.50, grades 7-adult. Film studies various pollutions, alternative courses of actions, need for communities to employ ecologists for planning.
4. THE RACE IS LOSING, 30 min., Time-Life Films, \$350, rental \$30, grades 7-adult. Shows how technology can be changed to aid the environment. Film is useful for groups or classes studying alternative choices for a better environment.
5. OUR POISONED WORLD -- GARBAGE, NOISE, HEAT, 30 min., Time-Life Films, \$350, rental \$30, grades 7-adult. Presents environmental problems. Film is helpful for groups or classes just beginning to work with environmental conservation.
6. NOISE: THE NEW POLLUTANT, 30 min., b&w, Indiana University, \$125, rental \$6.75. Film explains how sound is caused and how excessive noise can have harmful physiological and psychological effects.
7. THE NOISE BOOM, 26 min., color, NBC, University of Michigan, Mass Media Ministries. Film reports that two of three cases of deafness are due to noise, gives suggestions about what people can do about lessening noise.
8. SOUND OFF, 10 min., color, Pyramid. A teaching film on the dangers of living in a high-noise environment.
9. NOISE, 10 min., color, Bailey-Film Associates, elementary grades. Explains the difference between sound and noise, explores ways to limit noise.
10. DOWN, DECIBEL, DOWN, 9 min., color, King Screen Productions. A humorous, noisy film about noise pollution on the personal level.

*Addresses of film distributors are given at the end of this guide.

11. MEN AT BAY, 26 min., color, University of Michigan, King Screen Productions. Instructional: a spectrum of people who look at the problem of the deterioration of San Francisco Bay from a variety of viewpoints and interests.

Organizations

1. League of Conservation Voters
324 C St., SE
Washington, D.C. 20003
The League will send you a record of how all U.S. congressmen and senators voted on key environmental issues for \$1.
2. Sierra Club
220 Bush St.
San Francisco, Calif. 94108
3. Friends of the Earth
620 C St., SE
Washington, D.C. 20003
4. National Audubon Society
1130 Fifth Ave.
New York, N.Y. 10028
5. National Wildlife Federation
1412 16th St., NW
Washington, D.C. 20005
6. The Wilderness Society
729 15th St., NW
Washington, D.C. 20005
7. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
8. Environmental Defense Fund
162 Old Town Rd.
East Setauket, N.Y. 11733
9. The Conservation Foundation
1717 Massachusetts Ave., NW
Washington, D.C. 20036
10. World Wildlife Fund
910 17th St., NW
Washington, D.C. 20036
11. Izaak Walton League of America
1326 Waukegan Rd.
Glenview, Ill. 60025

12. The Nature Conservancy
1800 North Kent Ave., NW
Washington, D.C. 22209
13. Scenic Hudson Preservation Conference
Suite 1625
500 Fifth Ave.
New York, N.Y. 10036
14. Scientists' Institute for Public Information
(also Scientists' Committee for Public Information)
30 East 68th St.
New York, N.Y. 10021
15. Citizens for a Quieter City
345 Park Ave.
New York, N.Y. 10022

Government Agencies

1. Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
Enforces Federal environmental laws.
2. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20006
Advises the President. Each August publishes an environmental status report on the Nation, ENVIRONMENTAL QUALITY (see Publications).
3. Environmental Conservation Department
50 Wolf Rd.
Albany, N.Y. 12201
Supervises State environmental and conservation laws.
4. Environmental Protection Administration
Municipal Bldg.
New York, N.Y. 10001
Supervises city environmental matters, including sanitation, sewage, water resources.
5. New York City Bureau of Noise Abatement
51 Astor Pl.
New York, N.Y. 10003
6. Office of Community Assistance
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
For information about organizing local groups.

7. See listing of congressional committees in What can I do? section.
8. New York State Museum and Science Service
State Education Bldg.
Albany, N.Y. 12224

SCARS ON THE SURFACE



25/26

SCARS ON THE SURFACE

Perspective

In the beginning, the ancestors of the human species were an integral part of the natural world, as all other creatures remain today. Anthropologists tell us that Pygmies and other aborigines existing today regard the earth, the forest, the land as their parent.

This attitude was stated eloquently by American Indians to the white men who wanted their land, and sometimes even were willing to pay for it. Said an Indian spokesman at the Council of Drummond Island in 1816:

The Master of Life has given us land for the support of our men, women and children. He has given us fish, deer, buffalo, and every kind of birds and animals for our use... When the Master of Life, or Great Spirit, put us on this land, it was for the purpose of enjoying the use of the animals and fishes, but certain it was never intended that we should sell it or any part thereof which gives us wood, grass and everything.

A generation earlier, an Iroquois told George Washington:

The land we live on, our fathers received from God, and they transmitted it to us, for our children, and we cannot part with it...Where is the land on which our children and their children after them are to lie down?

A crucial, and perhaps the crucial way by which Homo sapiens freed -- or at least partially freed -- himself from nature's embrace and gained superiority over all other species is through the use and development of "tools." The almost bewildering array of technology today is but the latest stage of this evolution. At first, of course, the "tool" may have simply been a rock which in the hand of an ape-like hominoid conferred a quantum jump in hitting power. With time, proto-humans discovered the virtues of a cutting edge, and over the course of a million years the spearhead evolved into a formidable utensil. And creatures that once survived by picking berries and gnawing roots metamorphosed into the most fearsome hunters of all.

But there had to be a concomitant activity: a never-slackening search for materials to make better weapons, the first quest for a "resource" (a material becomes a resource only after man finds a use for it and assigns a value to it). These early hunters also were miners. Using stone hammers and picks of deerhorn, they scraped their way down to chalk or limestone beds, where the hard flint material for their weapons was to be found.

Jane Jacobs in The Economy of Cities theorizes that the first cities arose in the Middle East because of commerce in a mineral resource, and she selects obsidian, the tough natural glass produced by some volcanoes.

So important were mineral resources to human development that successive ages took their names from the discoveries -- Stone...Bronze...Iron. By this time we are into the story of modern man. In cybernetic interaction, as more mineral resources become available, human needs waxed ever greater...and still newer resources were fed into the process. Coal fueled the Industrial Revolution, petroleum accelerated it, uranium shifted us into the atomic age.

And ever-improved methods of extraction were required -- from the stone hammer and deerhorn pick to "Big Muskie," a strip-mining machine that stands 32 stories high and lifts 325 tons of earth at a scoop. The human appetite for the earth's resources has grown so voracious that an alarming thought is beginning to insinuate itself into the minds of men: the supply is limited.

In an effort to assay the inventory of natural resources, experts have calculated how long known global reserves would last if used at the current rate of consumption. Here are some of the estimates: coal 2,300 years, iron 240 years, aluminum 100 years, petroleum 31 years, natural gas 38 years, copper 36 years, tin 17 years, mercury 13 years. But consumption will not remain static. It will keep growing. Exponential consumption -- that is, continual growth with a doubling every few years -- achieves a voracity that is difficult for the unaided human mind to comprehend. With the projected increasing consumption rates for the years ahead, our most abundant nonrenewable resource, coal, would last only 111 years; and even if five times the known reserves of coal are discovered, that expanded supply would last for only a century and a half. Similarly, exponential consumption would reduce the world supply of iron to 93 years, aluminum 31

years, petroleum 20 years, natural gas 22 years, copper 21 years, tin 15 years, mercury 13 years...with only modest extensions even with discoveries of five-fold greater deposits.¹

Then there is the toll taken of the earth itself: the huge open copper pit in Montana that eats like leprosy toward the city of Butte, the ransacked Cumberland Mountains in impoverished Appalachia, the conversion of fertile Ohio farmland to desolate washboards. In the United States, the devastating method of strip mining is becoming ever more popular and now accounts for about 44 percent of the coal mined.

These wounds, the scars on the surface, reveal civilized man's attitude toward his land. The attitude is 180 degrees removed from the Indian's reverence. Land simply is another possession -- property -- or a means for profit -- units for speculation, spaces for investment in industrialized farming, acreage on which to plant housing subdivisions, or it is regarded as a supply depot.

¹These figures are taken from the April 1972 issue of Man Apart publication of Friends of the Earth. Most of the statistics come from the U.S. Bureau of Mines Mineral Facts and Problems, 1970, U.S. Government Printing Office, Washington, D.C. Other sources are: U.N. Department of Economic and Social Affairs, Statistical Yearbook 1969, United Nations, N.Y., 1970. Yearbook of the American Bureau of Metal Statistics 1970; Maple Press, York, Pa., 1970. World Petroleum Report, Mona Palmer Publishing, New York, N.Y., 1968. U.N. Economic Commission for Europe, The World Market for Iron Ore; United Nations, N.Y. 1968. Mineral Resources by P. T. Flawn; Rand McNally, Skokie, Ill., 1966. Metal Statistics, American Metal Market Company, Somerset, N.J., 1970. Commodity Data Summary, U.S. Bureau of Mines, U.S. Government Printing Office, Washington, D.C., January 1971.

The number of years known global reserves will last with consumption growing exponentially at the average annual rate of growth is calculated by the formula:

$$\text{Exponential index} = \frac{\ln((r s) + 1)}{r}$$

where r = average yearly growth rate
 s = the number of years known global reserves at current global consumption. Calculated by dividing known reserves by current annual consumption.

We have forgotten, says ecologist Eugene Odum, that the land, our earth, also is the oikos, our home (oikos is the Greek word for home, and is the root for "ecology" -- literally, "the study of organisms at home"). Ecology aims to bring man full circle, back into harmony with his environment.

At the root of the environmental crisis is the question: can we go home again?

The Broadcast: SCARS ON THE SURFACE

The broadcast begins with views of earth as seen by Apollo astronauts, an earth that is blue, beautiful, and unscarred. Then we see a montage of mined areas, scars on the planet's surface inflicted by man in his search for minerals and energy: iron from Minnesota, copper from Montana and Turkey, coal from Appalachia, England, and Germany, bauxite from Jamaica. The extractions have been going on for millennia, but now man's needs are growing exponentially. The demands for coal and other energy sources may triple by the year 2000.

Appalachia is a prime source for the coal which fuels American steel mills and electric power plants. West Virginia and Kentucky, surpassing Pennsylvania, Illinois, and Ohio, all yield their quota from the great field of black energy. Much of the extraction is by strip mining. In the steep, winding hills of Appalachia, this means contour mining -- carving out an L-shaped platform along the slope, like a mountain roadway. The soil, rocks, and trees taken out above the seam of coal are dumped down the hillside since there is no other place to put them. After the coal is removed and trucked away, it is virtually impossible to restore the hillside to its original condition. So it has been left that way, although recent laws have required some efforts at reclamation. The results have been an erratic defacing of the Cumberland Mountains, the threats of landslides to the homes of mountain people and, possibly most serious of all, the severe pollution of the streams that are the fountainheads of the great rivers of the area. This pollution is caused by sulfides associated with the coal and the runoff of sediment and nutrients from exposed land.

Harry Caudill, an East Kentucky lawyer who has defended the hill people in their fight against the depredations of strip mining and who wrote an eloquent book on the subject Night Comes to the Cumberlands, vividly describes the plight of his land and its people. Caudill makes a correlation between the impoverishment of the land and the well-known poverty of the people of Appalachia.

In Western Germany, where the surface coal mining is conducted on a more level surface, new techniques of restoration are being used. In a country where land no longer is plentiful, total reclamation is required as a license to mine. So, a huge wheel-like machine strips away the top layers of soil where there is organic life and lays them aside. After the coal is removed, the top strata are replaced. The land can once again be farmed or used for recreation or living communities.

This is a new technology. It is not so easy or simple to effect reforms in countries not already industrialized, where there is no great base of wealth and where the exclusive goals are to develop and achieve prosperity. Turkey is an example. The coal mining at Zonguldak is expanding to meet the needs of a huge new steel plant. The Turks have worked copper and iron in Central Asia since the earliest historical times, but today the demands for such mineral resources are greater than ever.

Turkey is only one of many developing countries. Others in Africa, Asia, and South America are scraping their surfaces for their mineral wealth, but in most cases they will have to export what they mined because they do not have the industrial facilities to transform the ore into finished products of today's civilization. The island of Jamaica in the West Indies is a case in point. Jamaica is the world's leading producer of bauxite, the ore from which aluminum is obtained. Most of this mined bauxite goes directly out of the country because aluminum extraction requires great amounts of electric power, which Jamaica does not have (although one processing plant has been built recently). So, in a sense, Jamaica grows richer by growing smaller.

In the American Southwest, the loss is not only physical, but spiritual. A tremendous new complex of electric power plants is rising at the four corners of the states of Arizona, New Mexico, Colorado, and Utah. In order to provide fuel, miners have begun to strip the coal lode from the Black Mesa, a site long revered as sacred by Hopi and Navajo Indians. Not only is the land being degraded physically, but the Indians feel that the very soul of the land is being destroyed.

Mining is probably as old as man himself and indispensable to his life today, but at some point there will have to come a reconciliation between the demands of man and nature's ability to meet those demands. Some of the environmental impact of mining can be cut down by land rehabilitation requirements and by reducing extravagant and trivial uses of resources.

Ecologist Aldo Leopold suggested that what is needed is a land ethic. Leopold wrote in A Sand County Almanac:

The first ethics dealt with the relation between individuals; the Mosaic Decalogue is an example. Later accretions dealt with the relation between the individual and society. The Golden Rule tries to integrate the individual to society; democracy to integrate social organization to the individual.

There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slavegirls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations.

The extension of ethics to this third element in human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity.

What can I do?

For openers, reexamine your attitude toward land and your relationship to it. It might help to recall that when Europeans came to America, they were either fleeing the evils of their own human societies and/or seeking the land of opportunity -- opportunity for political liberty and religious freedom, to better themselves, for the good life, success, and riches. They saw the forests as obstacles to be cleared for farmland and later as lumber. They saw the rivers as conduits for transportation and the streams as power to turn mill wheels and all waterways as conveyors to carry away wastes without charge. They saw beavers as raw material for men's hats and nearly exterminated the species. It was only much later that they discovered the wealth underground: gold, silver, coal, oil, uranium.

Few, if any, came to cherish a natural paradise. And rare was the newcomer with the special vision of John Brereton, a Cambridge theologian who landed on Virginia's shore in 1602 and recorded in his diary:

This island is full of faire trees, of high timbered oaks; Cedars, strait and tall; Beach, Elme, Hollie, Walnut trees in abundance; Strawberries, red and white, as sweet and much bigger than ours in England. Raspberries, Gooseberries, Hurtleberries, and such. Also many springs of excellent sweet water, which is maintained with the springs running exceedingly pleasantly thorow the woodie grounds. This lake is full of small Tortoises, and exceedingly full of divers fowles as Cranes, Hershaves, Bitters, Geese, Mallards, Teales, which breed, some lowe on the banks, and others on lowe trees, about this lake in great abundance, whose young ones of all sorts we tooke and eat at our pleasure. Here are also great stores of Deere, which we saw, and other beasts, as appeared by their tracks. Coming ashore, we stood a while like men ravished at the beautie and delicacie of this sweet soile.

Secondly, try to appreciate, or at least identify, the costs of various benefits. For example, if the cost of electricity were simply the penny or two we pay for a kilowatt hour of electricity, it surely would be the bargain so many industry officials say it is. Unfortunately, that payment is incidental. The real cost is three quarters of a pound of coal per kilowatt hour, the inexorable depletion of a nonrenewable resource. It includes the methodical strip mining of the United States. Already an area the size of Connecticut and Rhode Island has been disturbed. There's sulfur dioxide in the air, depletion of oil, spills into rivers and oceans during the transportation of oil, thermal pollution, subsidence of land from deep mining, acid pollution from abandoned deep mines and sediment pollution from strip mines of tens of thousands of miles of streams, an end to most of America's wild rivers which have been dammed to provide hydroelectric power, visual and esthetic pollution from above-ground power lines.

Try this kind of cost accounting for other commodities.

Thirdly, try fitting yourself more economically into your world. Cut down dependence on electrical and other sources of energy (See What can I do? sections of THE CAR IN THE CITY, SIX FATHOMS DEEP, THE AIR WE BREATHE). Reject frivolities or any nonessential purchases that contribute to resource depletion. If everyone kept his present automobile one year extra, the saving in steel would be enormous. Question some of today's merchandising practices. Doesn't it seem a wanton extravagance to enclose 12 ounces of soda pop within all that nonrenewable steel or aluminum? It might be more justifiable if the metal were recycled.

Fourthly, support, take part in all forms of recycling and reuse (See What can I do? section of YOU CAN HELP -- THROW IT HERE).

Fifthly, learn about land rehabilitation legislation in your state and support those efforts which are well thought through.

Write to your congressman and other representatives about the above matters. Support candidates, lawmakers, officials who have an ecological outlook.

Finally, in making these suggestions or recommendations, it should be remembered that these acts in themselves will have repercussions. And reactions to them will have to be thought through. Just as one example -- if everyone kept his automobile an extra year, there would be an enormous saving in steel, but there could be an incalculable impact upon the economy. There could be such a downturn in the auto industry that many jobs would be lost or furloughed. With foresight, this lost business

might be compensated for in other ways -- increased auto service, using recycled metals to build mass transit vehicles, the planned encouragement of other industries. Obviously, it wouldn't be easy. At the same time, we want to extricate our society from the position of making things that are no longer needed or are environmentally harmful simply to keep the economy turning. This latter situation would mean that we have lost control of our technology and it is operating independently from human needs or wishes like a sorcerer's apprentice.

For a further discussion of the complex interactions among people, resources, and environment, see the What can I do? section of ALL THE FISH IN THE SEA.

For further information

Books

1. NIGHT COMES TO THE CUMBERLANDS by Harry Caudill; Little, Brown and Company, Boston, 1962, \$2.45. The classic on what has happened to Appalachia.
2. MY LAND IS DYING by Harry Caudill; E. P. Dutton, N.Y., 1972, \$6.50. Bringing the book above up to date.
3. THE QUIET CRISIS by Steward Udall; Avon, N.Y., 1964, 95¢. See the first chapter "The Land Wisdom of the Indians" and the last "Notes on a Land Ethic for Tomorrow."
4. A SAND COUNTY ALMANAC by Aldo Leopold; Oxford, N.Y., 1949, 1966, \$6.50. See "The Land Ethic."

Publications

1. MINERAL FACTS AND PROBLEMS, 1970, U.S. Bureau of Mines, U.S. Government Printing Office, Washington, D.C.
2. ELECTRIC POWER AND THE ENVIRONMENT, A Report Sponsored by The Energy Policy Staff, Office of Science and Technology, August 1970. U.S. Government Printing Office. Advocates counting in the environmental costs and employing a unified energy policy.
3. BITUMINOUS COAL FACTS, an annual report filled with statistics by the National Coal Association (see Organizations).

4. SURFACE MINING AND OUR ENVIRONMENT, a special report to the Nation by the U.S. Department of the Interior. The definitive study of surface mining in the United States to the mid-1960's. U.S. Government Printing Office. \$2.
5. EFFECTS OF SURFACE MINING ON THE FISH AND WILDLIFE RESOURCES OF THE UNITED STATES, Department of the Interior, Fish and Wildlife Service, Resource Publication 68, 1968, U.S. Government Printing Office. 60¢.
6. STUDY OF STRIP AND SURFACE MINING IN APPALACHIA, Department of the Interior, 1966. U.S. Government Printing Office. \$1.

Articles

1. Review of "The Limits to Growth" by Hugh Nash in NOT MAN APART (a publication of Friends of the Earth, 529 Commercial St., San Francisco), April 1972. This review contains a list of 19 nonrenewable natural resources, their known global reserves, how many years it would take to consume them at current rates, and other statistics based mainly on MINERAL FACTS AND PROBLEMS, 1970, published by the U.S. Bureau of Mines.
2. "The Human Revolution" by Charles F. Hockett and Robert Ascher; CURRENT ANTHROPOLOGY, 5 (3):135-168, 1964. Also anthologized in THE SUBVERSIVE SCIENCE edited by Paul Shepard and Daniel McKinley, Houghton Mifflin, Boston, 1969. The article summarizes biological and social evolutionary changes.
3. "The Human Species." The September 1960 issue of SCIENTIFIC AMERICAN is devoted to the evolution of man with nine separate articles.
4. "The Historical Roots of Our Ecological Crisis" by Lynn White, Jr.; SCIENCE, 155:1203-1207, 1967. Also anthologized in THE SUBVERSIVE SCIENCE.
5. "Power Corrupts" by Osborn Segerberg, Jr.; ESQUIRE, March 1972. On the relationship of the Tennessee Valley Authority to strip mining.
6. "As More and More Coal is Stripped from the Land, the States Are Hard Put to Exercise Effective Control" -- CF LETTER, January 1972; The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036.

7. "Appalachia -- Like the Flayed Back of a Man" by James Branscome; NEW YORK TIMES MAGAZINE, Dec. 12, 1971.
8. "Coal Rush Is On as Strip Mining Spreads Into West" by Ben A. Franklin; THE NEW YORK TIMES, Aug. 22, 1971.
9. "Taming the Strip-Mine Monster" by Edmund Faltermayer; LIFE magazine, Oct. 1, 1971.
10. "Strip-Mining Boom Leaves Wasteland in Its Wake" by Ben A. Franklin; THE NEW YORK TIMES, Dec. 15, 1970. On strip mining in Ohio.
11. "Paradise Is Stripped" by Harry M. Caudill; NEW YORK TIMES MAGAZINE, March 13, 1966. On the TVA steam plant and surrounding mines at Paradise, Ky.
12. "The Lonely War of a Good Angry Man" by David McCullough; AMERICAN HERITAGE, December 1969. About Harry Caudill and strip mining.
13. "The Price of Strip Mining" -- TIME Magazine, March 22, 1971.
14. "The Economics of Environmental Quality" by Sanford Rose; FORTUNE Magazine, February 1970. On the business of "externalities" or costs that businesses never pay.

Films*

1. BEFORE THE MOUNTAIN WAS MOVED, 58 min., color, Contemporary Films/McGraw-Hill, \$595; rental, one classroom showing, \$50. Examines the dilemma faced by residents of the Appalachian mountains due to indiscriminate and careless mining practices.
2. RAVAGED LAND, 15 min., color, University of California, rental \$15. Explores environmental damage in Appalachia caused by strip mining, recommends reforms based on mining practices in England and central Europe.
3. OUR VANISHING WILDERNESS Series: THE WATER SO CLEAR A BLIND MAN COULD SEE, 30 min., color, Indiana University, \$315, rental \$11.50, grades 7-12. On the harmony of New Mexico's Taos Indians with the land. Produced by National Educational Television.
4. ALTERED ENVIRONMENTS: AN INQUIRY INTO THE AMERICAN WILDLANDS, 10 min., BFA Educational media, \$135, rental \$8, grades 1-9. A basic theme is man's exploitation of America's wildlands and their natural resources.
5. THE COMING OF MAN, 13 min., color, Contemporary Films/McGraw-Hill, \$175, rental \$12.50. Evolution of primates from the development of the opposable thumb to farming, exploring ape-man, stone age man, Neanderthal man and Cro-Magnon man.

*Addresses of film distributors are given at the end of this guide.

Organizations

1. U.S. Bureau of Mines
Department of the Interior
Washington, D.C. 20240
2. Department of the Interior
Washington, D.C. 20240
3. National Coal Association
Coal Bldg.
Washington, D.C. 20036
4. Federal Power Commission
441 G St.
Washington, D.C. 20426
5. American Petroleum Institute
1801 K St., NW
Washington, D.C. 20006
6. United Mine Workers Union
900 15th St.
Washington, D.C. 20005
7. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
Has developed an extensive file on surface mining.

**AMONG
THE LIVING**



39/40

AMONG THE LIVING

Perspective

In many respects, and as far as we can tell, we are the most successful species that ever existed on earth. Nature acknowledges success with a standard reward. It allows more members of that species to survive. More are born. The population grows. But there is a limit. There is always a limit. In nature, a population usually will surpass the limit, then adjust -- that is, contract -- until it meets the particular ecosystem's carrying capacity. When we look around us, we see that populations of all species are regulated. When a population has used all the available food, space, sunlight, resources or as much of these as possible in competition with other species -- then that population stops growing and settles into an equilibrium with its environment. If the population exceeds the environment's carrying capacity by a great amount, as in the case of some insects, or if the environment suddenly changes, when a food source is removed by harvest, for instance, there is a "crash" -- a mass die-off.

We have been so successful in providing food for ourselves, in defeating our enemies, in manipulating the environment to our advantage that human growth is an extraordinary event. Bacteria, for example, can double every 20 minutes and with sufficient food and space could grow in 36 hours to cover the entire planet. One hour after that, if the growth kept on, the bacteria would be over our heads. In contrast to the bacteria, whose doubling rate is constant, the human population doubling time has been growing shorter all through history. From the dawn of agriculture about 10,000 years ago to the time of Christ, the human population grew from about 5 million to some 130 million. The average doubling rate for that period was 1,800 years. Today, the doubling time is 35 years (while the base has grown to more than 3.6 billion individuals).

A learned committee on resources and man of the National Academy of Sciences has concluded that possibly the earth could support a maximum of 30 billion people -- but under miserable living conditions and near starvation for most. This fantastic sum is only three doublings -- about a century -- away. The multidisciplinary committee concludes that "a human population less than the present one would offer the best hope for comfortable living for our descendants, long duration for the species, and the preservation of environmental quality."

It has been popular to assign overpopulation to poor, underdeveloped countries, but today scientists are learning to broaden their thinking. For instance, one American uses 35 times as much energy as a citizen of India, 100 times as much as the pre-Columbian inhabitants of the United States. The complex, highly industrialized American civilization -- with 6 percent of the world's population -- requires perhaps 40 percent of the world's resources in order to maintain itself. In terms of carrying capacity, is this overpopulation? In terms of survival, who is more vulnerable -- the Indian whose needs are modest or the American whose requirements are vast?

The Broadcast: AMONG THE LIVING

AMONG THE LIVING relates population growth to contemporary life, focusing on the Long Island town of Huntington where population has doubled twice during the past two decades. With only 25 percent of its 100 square miles still undeveloped and vacant land disappearing, Huntington is trying to work out a novel ecological land use program that would in effect begin to curtail and eventually stabilize its population.

Such an attempt aggravates already bruised conditions in our society -- fears that the policy is exclusionist, with race and wealth the de facto standards. On the other hand, to follow a laissez faire policy will mean that historically attractive Huntington will join other crowded areas in Nassau and Suffolk counties where the entire population may soon be too large for the local water supply.

The dilemma leads to a larger discussion of just what is an optimum population size for any particular area (including the entire world). This question of an "optimum" population is a surprisingly belated one to come to the attention of science and is just beginning to be investigated and debated. So tangled and complicated are the issues that there is a variety of opinions.

Population biologist Paul Ehrlich, who believes we are overpopulated worldwide and U.S.-wide, says an optimum population for the United States would be somewhere between 50 and 100 million people, and he estimates that if all the people on the globe were to exist at the U.S. standard of living, then the planet could support a world population of only 500 million, one seventh its present size. Another ecologist, microbiologist Barry Commoner, believes that present environmental deterioration is due not so much to population growth as to the misuse of technology. Social scientist Philip Hauser, aware that inventive man has managed to expand the food supply constantly and has added impressively to his list of resources even while depleting natural supplies, decries what he sees as alarmist attitudes toward population growth.

There is one common ground for all the experts, no matter how divergent their views. Since the planet and its resources are finite, they agree that human population growth must come to an end, and will. The real questions are when and how.

What can I do?

You can examine your attitudes. Do you believe that an old maid, a spinster, a "bachelor girl" is a failure in life? Do you feel that if a man does not marry, he must be a social misfit? A great many Americans do hold these attitudes although there was a time not so long ago when the maiden aunt was a valued member of the family, a staple of society, and the bachelor the center of attention. One result of the present social pressure is a near universal conformity -- most Americans marry.

Not only do most Americans marry, but traditionally they marry young. Thomas Malthus remarked on this penchant back in 1798 when he wrote his famous essay on population: "In the United States of America, where the means of subsistence have been more ample, the manners of the people more pure, and consequently checks to early marriage fewer than in any of the modern states of Europe, the population has been found to double itself in twenty five years."

To cite an example of what delay in giving birth can mean to population growth, zoologists compare two elephant refuges in Africa. In one, where the density is relatively low, the young are weaned at age 8, the female gives birth to her first offspring at 12, then reproduces once every 7 years. In the high density area, because the foliage has been stripped high up on the trees the young elephants nurse until age 10. The female does not begin reproducing until she is 20 years old and then breeds every 12 years. This delay and spacing of offspring cuts reproduction in half and reduces population growth by two-thirds.

To put it in human terms, let us suppose a woman born in 1900 reproduces at maximum capacity. She has one daughter a year from the time she is 15 until she is 45 years old -- 30 daughters. Each daughter also reproduces at the maximum rate. By 1950, that family numbers 317 offspring. If the original woman had delayed just 2 years -- did not have the first two daughters -- then the family would be smaller by one quarter. In Ireland and some other European countries where populations are nearly stabilized, late marriages are common. (An extensive survey conducted among 28,000 American families showed that 28 percent of the men who married before the age of 22 were divorced compared to only 13 percent of those married after 22. Among women, 27 percent of those who entered into teenage marriages were divorced compared with only 14 percent of those who married in their 20's. Having children during the first 2 years of marriage doubles the probability of divorce.)

Starting in the 1960's and then accelerating in 1971 the United States birth rate has declined; by the first quarter of 1972 it probably had reached an unprecedented low of a zero growth rate...meaning that the national population would no longer increase if that rate were maintained for 70 years. Until this decline, which could reverse itself just as quickly, the population of the United States had been increasing at a rate of one percent a year. This doesn't sound like much, but it means that 70 years from now there will be twice as many Americans as there are today if the rate continues. If you believe that extra large families, particularly in minority groups are mainly responsible for this increase, you would be wrong. The reason for the growth is that so many average American parents decide to have three or four children. If the two-child family became the idea, then social pressure would work for population balance.

Back to attitudes. Do you believe there is something "wrong" with the childless couple? Do you think a man and wife can have as many children as they want, no matter what the number, as an absolute right without any other considerations? Do you believe that a woman really has only one role in life -- to be a mother and housewife?

The childless man and wife should be objects of civic gratitude, for they are paying more than their fair share in school and other taxes which educate and care for other people's children. As for everyone having as many children as he or she wants, President Nixon has said in a message to Congress, entitled "Problems of Population Growth": "Perhaps the most dangerous element in the present situation is the fact that so few people are examining these questions from the viewpoint of the whole society." (People can have large families through adoption without adding to the population.) As for the third question, social scientists say many women become full-time, lifelong housewives through default (hardly the best way to become anything) because they have not been educated, trained, or encouraged to make any other contribution to society.

Finally, ask and then find your answer to these questions. Is it immoral to bring an unwanted child into this increasingly crowded, competitive world? Is a philosophy of perpetual growth -- whether economic, industrial, physical -- realistic? If our goal has changed to stabilizing population, shouldn't income tax exemptions be eliminated after the second child?

Your attitude affects others. You would be surprised how influential you can be by passing along your conclusions to your congressman, senators, and state representatives.

For further information

Books

1. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, \$2.95. The most authoritative study to date on the resource-population equation.
2. EFFECTS OF POPULATION GROWTH ON NATURAL RESOURCES AND THE ENVIRONMENT, hearings before a Subcommittee of the House Committee on Government Operations, 91st Congress; U.S. Government Printing Office, Washington, D.C., \$1. Excellent discussion with diverse points of view.
3. THE POPULATION BOMB by Paul R. Ehrlich; Ballantine Books, N.Y., 95¢. A simple, polemical approach to the population problem; the book that made Dr. Ehrlich famous.
4. POPULATION, RESOURCES, ENVIRONMENT by Paul R. and Anne H. Ehrlich; W. H. Freeman, San Francisco, \$8.95. An erudite, statistics-filled, bibliographed volume and an explanation indicating why Dr. Ehrlich enjoys a high reputation among scientists.
5. THE LIMITS TO GROWTH by Dennis L. Meadows, et al., Potomac Associates, Washington, D.C., \$2.75. The highly-publicized Club of Rome report on computer studies of various kinds of growth on the world scale.
6. POPULATION, EVOLUTION, AND BIRTH CONTROL by Garrett Hardin; W. H. Freeman, San Francisco, \$2.95. A collection of pertinent material on the subject, including excerpts from Malthus' essay as well as Hardin's "The Tragedy of the Commons."
7. THE FINAL REPORT OF THE U.S. COMMISSION ON POPULATION GROWTH AND THE AMERICAN FUTURE, U.S. Government Printing Office; also a paperback edition published by New American Library, 1301 Avenue of the Americas, New York, N.Y. 10019.
8. ARE OUR DESCENDANTS DOOMED? edited by Harrison Brown and Edward Hutchins; Viking, N.Y., 1972, \$3.45.
9. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., \$6.95. A look at the equation with emphasis on technological aspects.
10. TOO MANY AMERICANS by Lincoln Day and Alice Taylor Day; Dell Publishing Co., N.Y., \$1.95. The viewpoints of social scientists. Mr. Day is chief of the United Nations demographic section.

11. ABORTION: LAW, CHOICE AND MORALITY by Daniel Callahan; Macmillan, N.Y., 1970, \$14.95. A survey.
12. THE AMERICAN POPULATION DEBATE edited by Daniel Callaghan; Doubleday, Garden City, N.Y., 1971. \$2.50.
13. A SOURCEBOOK ON POPULATION; 1969, 50¢. Surveys the whole population field, available from Population Reference Bureau (see Organizations).
14. SCIENCE FOR SOCIETY -- A BIBLIOGRAPHY by John Moore; 1971, \$1. More than 4,000 recent books and articles. Available from the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005.
15. An extensive bibliography may be obtained from Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. The organization maintains a library devoted to population and related subjects.

Articles

1. "Population: the U.S. Problem, the World Crisis," supplement, THE NEW YORK TIMES, April 30, 1972, Section 12. Also contains brief bibliography.
2. "Problems of Population Growth" by Richard M. Nixon, the President's message to Congress on the population question, July 18, 1969. U.S. Government Printing Office.
3. "The Human Population" by Edward S. Deevey, Jr., SCIENTIFIC AMERICAN, September 1960.
4. "Resources, Population, and Quality of Life" by Preston Cloud; Meeting of the American Association for the Advancement of Science, Boston, December 1969.
5. "Effects of Population Growth on Natural Resources and the Environment," hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, September 15-16, 1969. U.S. Government Printing Office.
6. "Toward a Non-Malthusian Population Policy" by Jean Mayer, COLUMBIA FORUM, Summer 1969.
7. "An Essay on the Principle of Population" by Thomas Malthus, 1798.

Films*

1. THE TIME OF MAN, 50 min., color and b&w, Holt, Rinehart & Winston, rental \$40. Superbly filmed record of man's evolving relationship with his environment.
2. POPULATION ECOLOGY, 19 min., color, Encyclopedia Britannica Educational Corporation, rental \$12.50. Exposition of growth and regulation of natural populations with consideration of anomalous factors in the human situation.
3. BANQUET OF LIFE, 55 min., S.U.N.Y. College of Forestry. Discusses the population spiral and finite resources of earth.
4. NO ROOM FOR WILDERNESS, 30 min., color, Association Films, rental \$5.
5. THE EARTH AND MANKIND -- six films, 28 min. each, b&w, Contemporary Films/McGraw-Hill, rental \$14 each. Produced by the National Film Board of Canada, the films are about population and food supply. They are "People by the Billions," "Man and His Resources," "To Each a Rightful Share," "The Global Struggle for Food," "Can the Earth Provide," "Challenge to Mankind."
6. THE POPULATION PROBLEM -- six films, 30 min. each, color or b&w, University of Indiana, rental \$10 each. Produced by National Educational Television, the films are "Brazil: The Gathering Millions," "The European Experience," "Japan: Answer in the Orient," "India: Writing in the Sand," "USA: Trouble in Paradise" (40 Min.), "New Facts of Life."
7. THE PROBLEM IS LIFE, 29 min., color, Contemporary Films/McGraw-Hill, rental \$11. Portrays the birth control program in India.
8. A SINGLE STEP, 28 min., color, Planned Parenthood/World Population, rental \$12.50. Shows the connection between population stress and environment.
9. STANDING ROOM ONLY, 25 min., color, Contemporary Films/McGraw-Hill, \$325, rental \$18. Film examines the proposition that the world can support an ever-rising population. Produced by CBS for the 21st Century.
10. POPULATION EXPLOSION, 15 min., color, Contemporary Films/McGraw-Hill, \$200, rental \$12.50. A National Film Board of Canada production.
11. Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. Will provide a guide free of charge to a variety of films on the subject.

*Addresses of film distributors are given at the end of this guide.

Filmstrips

1. THE PEOPLE PROBLEM. Two parts, 14 min. each. Color filmstrip and two records; includes interviews with Dr. Alan Guttmacher of Planned Parenthood and Dr. Bernard Berelson of The Population Council. Price: \$35 from Guidance Associates, Pleasantville, N.Y.

Organizations

1. Planned Parenthood/World Population, 810 Seventh Ave., New York, N.Y. 10019. (affiliates, 190 of them, through the United States) For comprehensive advice on family planning, contraceptive methods, and so forth.
2. Family Planning Information Service, 300 Park Ave. South, New York, N.Y. 10010; (212) 677-3040. For information about abortion.
3. United Nations
Population Division -- for information on birth control programs.
U.N. Fund for Population Activities, United Nations Development Programme -- raises money for fertility control.
Demographic section -- world population statistics.
United Nations Plaza, New York, N.Y. 10017
4. Population Council
245 Park Ave.
New York, N.Y. 10017
A nonprofit organization specializing in scholarly presentations on population developments.
5. Population Reference Bureau
1755 Massachusetts Ave., NW
Washington, D.C. 20036
A nonprofit organization which publishes population statistics and various scientific studies.
6. Bureau of the Census
Department of Commerce
Suitland, Md. 20233
For vital U.S. statistics on population.
7. Office of Information
National Center for Health Statistics
Health Services and Mental Health Administration
Rockville, Md. 20852
For vital statistics on births, deaths, diseases, actuarial tables, etc.

8. Zero Population Growth
4080 Fabian Way
Palo Alto, Calif. 94303
A nonprofit organization lobbying for population
stabilization with 300 local chapters.

Conferences

1. The United Nations will hold a conference on population,
scheduled for 1974.

**POWER
TO THE
PEOPLE**



51/52

POWER TO THE PEOPLE

Perspective

Energy is the fuel of life. The 2,000 or more calories of energy you take into your body each day in proteins, carbohydrates, and fats sustain your life. If you do not eat enough food to meet minimum requirements, you begin to lose weight; if the process continues long enough, you become emaciated and finally die.

This biological energy comes from other (once) living things -- plants and animals. The ecological food chain is simply the network by which energy passes through the living community. The whole structure is based on the device nature effected billions of years ago to capture and utilize solar energy -- photosynthesis. Through photosynthesis, plants manufacture enough material for themselves and have enough left over to feed grazing and browsing animals -- the herbivores. Energy is lost in the transfer, but still enough remains so that other animals can kill and live off herbivores. We know these carnivores as predators. With an energy loss at each level of transfer, what we see is a pyramid of life. Man takes an ever increasing helping from this natural repast, and his extra-biological energy budget is growing even faster.

In the beginning, 10, 20 million years ago, our ape-like hominoid ancestors competed with the creatures of other species for the contemporary solar energy with little or no particular advantage. These hominoids gathered berries and nuts, ate roots and carrion when they could. It was not until perhaps 2 million years ago with the discovery of tools (weapons) that hominoids (as later stages of ape-men were called) gained an advantage. They became predators, carnivores, and as meat-eaters, bands of them could extend their range. They were no longer limited to perennially fair weather areas.

Actually, this meant that the protohuman species could avail itself of newer and greater sources of biological energy, but such an advantage leads to further exploitation. "Between this earliest stage and the dawn of recorded history," writes M. King Hubbert, "this species distinguished itself from all others in its inventiveness of means for the conquest of a larger and larger fraction of the available energy. The invention of clothing, the use of weapons, the control of fire, the domestication of animals and plants, all had this in common: each increased the fraction of solar energy available for use by the human species, thereby upsetting the ecologic balance in favor of an increased population of the human species, forcing adjustments of all

other populations of the complex of which the human species was a member."¹

Human beings kept enhancing their energy supply by chopping down forests to supply heat, tapping water and wind for power, using beasts of burden, and increasing farmlands. All of these sources of energy are directly related to the sun. "Emancipation from this dependence on contemporary solar energy was not possible until some other and hitherto unknown source of energy should become available."

This occurred in Western Europe during the 12th or 13th centuries with the discovery of coal. This also was solar energy, to be sure, but energy that had been locked away for hundreds of millions of years. The importance of coal did not become fully realized until 200 years ago when James Watt invented the steam engine; then the chemical energy from coal could be converted to physical work. Another energy revolution occurred during the past century or so with the discovery of another fossil fuel source -- oil -- and its power converter, the internal combustion engine.

¹This statement is from Resources and Man (see Books).
The Atomic Energy Information Service gives the following energy-source timetable:

Fire.....	360,000 BC	(other sources say 500,000 BC)
Domestic animals.....	6000 BC	(8000 BC?)
Wind (sailing).....	3500 BC	
Charcoal (smelting metal).....	3000 BC	
Water power (milling, pumping).....	1000 BC	
Whale oil (light).....	900 AD	
Coal.....	1300	
Coke (smelting steel).....	1753	
Electric battery (telegraph).....	1844	
Petroleum.....	1857	
Steam electric power.....	1882	
Hydroelectric power.....	1886	
Gasoline (horseless carriage).....	1886	
Central station electric power.....	1896	
Widespread electrical power.....	1926	
Nuclear power.....	1945	
Nuclear electric power.....	1957	

Today, the average American still uses 2,000 calories or so of food energy as did his prehistoric forebears; but today that intake comprises only 1 percent of the average American's energy budget. The other 99 percent powers his generators, automobiles, airplanes, factories, communications networks. Civilized man has grown to be almost as dependent on this total energy budget as were his predecessors on their modest allotment. In fact, modern man's energy needs are doubling every 10 years, and he must continually seek new sources.

It is in this context that the peaceful use of nuclear power appears in our history. Again, a totally new source, hitherto unexpected before the turn of this century and the Einsteinian equation. It is the first source of power not derived from solar energy. As a fuel, it could be virtually unlimited.

Yet there are drawbacks, as we learn from the broadcast, which explores contemporary energy sources.

The Broadcast: POWER TO THE PEOPLE

The broadcast begins by suggesting how enormous has become our appetite for energy -- in the next 30 years we will use as much power as all the humans who ever lived, and this despite the fact that two-thirds of the world's population has no electricity. This demand for energy is doubling every 10 years.

Then two questions are posed. One is physical, technological. Can this demand be met? The other requires a value judgment. Should it be met?

The Northeast power blackout of November 9, 1965, was a chilling...and amusing...brief look at what happens to a highly industrialized civilization when the electric power is snapped off. It is a demonstration in reverse of how dependent on external forms of energy we have become.

Geologist M. King Hubbert takes us back through time to tell how things began: the oldest living entity, a microorganism, 3.2 billion years ago...oil deposits dating back 600 million years... coal formed in the carboniferous age 300 million years ago... vertebrates 100 million years ago...human history beginning some 10 thousand years back.

We review the various energy sources. Oil, now the main source of industrial energy, is being consumed at a much faster pace than new deposits are being discovered. Its lifetime could be just another century more or less. Coal will last a few centuries longer, but most of it is high sulfur content, causing severe air

pollution. Strip mining, by which 44 percent of the coal in the United States is extracted, exerts a devastating impact upon land. The potential for hydroelectric power is substantial in undeveloped areas of South America, Africa, and Southeast Asia, but most dam sites already have been exploited in Western Europe and North America. Geothermal power is another possibility, but is limited to the availability of underground steam and does not appear to be the answer to the world's energy needs. Ocean tides contain enormous power, but there appear to be few suitable places where the energy can be harnessed. The sun, of course, is the ultimate source of all our energy except nuclear, but so far our technological concepts are not equal to capturing this power directly and converting it to our uses, at least in a practical, satisfactory way.

This leaves nuclear energy.

At present, the atom supplies only about 1 percent of the world's power, but by the year 2000, as much as half of the world's power may come from nuclear energy. Most nuclear plant reactors today use uranium 235, which is in short supply, but with second generation breeder reactors, nuclear fuel would be plentiful for thousands of years.

Nuclear plants do not emit air pollution, but they do give off radiation. A former New York City Environmental Protection administrator and now a professor of environmental medicine, Merrill Eisenbud, says that people living in the vicinity of a nuclear plant probably would be exposed to less radiation in a year than passengers on one airplane flight from New York to Chicago. Nuclear physicist and science writer Ralph Lapp tells, on the other hand, of one remote but horrendous possibility, an uncontrollable runaway reaction in the uranium core "forming a great molten mass of glowing material which will go down into the earth. Experts who talk about this have a name which they somewhat humorously apply to it. They call it the 'China syndrome.'"

The other major environmental problem with atomic power plants is waste heat, thermal pollution. The nuclear plant heats water to make steam to turn turbines to drive generators to produce electricity. The spent steam must be cooled and condensed back to water for reuse in the plant's closed system...and water from an adjacent river, lake, bay is required for this job. But when that water is returned, it is hotter than it was originally, often causing great changes in the biological life in the body of water. Several experts discuss what limits should be placed on this thermal discharge, and what methods are appropriate for cooling the water before it is returned to its natural body. This still is one of the important areas for public discussion, litigation, and determination. Ralph Lapp believes that by the year 2100 we will require so many huge power plants that they will be built on artificial islands offshore in the oceans because so much water will be required for cooling.

Another unresolved problem is what to do with nuclear wastes, particularly those which are highly radioactive and will remain so for tens of thousands of years. One proposal has been to seal them in ceramic cylinders and bury them in salt deposits. However, it is pointed out that if water somehow reaches the area, then the sealing characteristic of the salt is destroyed.

Public issues lawyer Anthony Roisman says flatly, "Now that kind of a waste simply should not be produced. We can't use it, we cannot recycle it. We have no way to detoxify it. We simply have to live with it for 50,000 years and my own judgment is that that makes it an unacceptable kind of way to generate electricity."

Science writer Lapp says, "This is one of the great unresolved problems for the world. And I think that it's high time that international authorities got together and made this a high priority assignment because nuclear power is coming."

The broadcast then examines what nuclear power means to a developing country, India. Finally, off on the horizon is the promise of controlled fusion, the energy of the sun. Not yet perfected, scientists don't know if it ever will be; but it offers an almost limitless supply of fuel from the seas. However, there still will be problems -- management of the radioactive element, tritium; and the final limit -- that of the enormous waste heat which will be cast into the biosphere. Eventually the "waste" heat produced would melt the massive Antarctica ice caps and those of Greenland into waters which would flood highly productive lowlands where almost 50 percent of the human population lives at present.

This brings us back to the opening questions. When it comes to energy, we see that we must make evaluations, decide which trade-offs we want to make, and this gets back to deciding what kind of lives we want for ourselves and our children, how much weight to give to material things, how much to quality of living.

What can I do?

Perhaps the most important thing one can do when it comes to the subject of energy, particularly nuclear energy, is to learn -- to take to heart -- two of ecology's fundamental lessons. One is: you don't get anything for nothing. As ecologist Barry Commoner put it, "There is no free lunch." The trouble is we frequently do not recognize at first in what coin the payment must be made. When we finally are presented with the bill, we sometimes discover that costs far exceed benefits (who would knowingly, willingly have created the Dust Bowl of the 1930's?) or that a select few have benefited, while the majority must pay (as in the case of power plants that get rid of effluents free of charge to the detriment of our air and waterways). Economists have taken to calling these business "freebies" as "external costs," or "externalities."

This leads to the second ecological law: you can never do just one thing. There is an old axiom that the successful person "keeps his eye on the doughnut and not on the hole," and this may be a very valid rule for personal conduct. Certainly an individual must have a positive attitude in order to achieve what he sets out to do, but on the grand scale there is a flaw in this policy. Even if one ignores the hole, it does not go away. Negative effects of an action will not be avoided simply because they are not anticipated or intended. For years, many people have tried to downgrade unwanted or unintended effects to a second class status, calling them "side" effects, but as ecologist Garrett Hardin has pointed out: effects are effects.

What we must do is make a valiant attempt to assess all effects -- try to figure out the whole bill beforehand -- before we commit ourselves to a broad, possibly irreversible course of action. The use of energy merits such citizen examination. With each new form of energy, with each increment in the growth of power, man is further freed from physical labor, he can accomplish more work, his comfort is enhanced, his conveniences multiplied; but power is double-edged. As we have seen and will see elsewhere in this series (SCARS ON THE SURFACE, SIX FATHOMS DEEP, THE AIR WE BREATHE), the toll on environment and upon health also escalates.

With nuclear energy, the risks peak along with the benefits. As this broadcast brings out, as we diminish and then deplete fossil fuels, we must turn to other energy sources (it's either that or drastically reduce population and/or standard of living). At the moment, there appears to be no other recourse except nuclear energy. Then we will have to coexist with the threat of ever-mounting hazards.² Is it fair to saddle our posterity with constantly-swelling, highly dangerous packages of radioactive wastes? Or will technology be able to solve this problem? Second-generation breeder reactors will mean a proliferation of plutonium, the explosive for atom bombs. How far are we willing to increase the risks of having such a substance get into the hands of extortionists, terrorists or the mentally deranged? Controlled fusion power, not yet perfected, holds the promise of virtually unlimited fuel for power, but it also would bring a tremendous jump in waste heat. Alvin Weinberg, a nuclear physicist, told a scientific meeting that breeder reactor power plants could supply the energy needs for 20 billion people on the planet. The real questions are what would life be like with that many human beings, and what would the thermal pollution from 4,000 such power plants do to the environment? Shouldn't someone be making those calculations? Shouldn't we be making a greater effort to utilize solar energy,

²Two nuclear scientists, John Gofman and Arthur Tamplin, have charged that low level radiation at present is causing excessive cancer and leukemia deaths. It is a frustrating scientific argument, for the contention can neither be conclusively proved nor refuted scientifically.

which is environmentally more compatible even if, at the moment, technologically more prohibitive? Of course, there's the other alternative: that we curb our energy demands. Shouldn't someone be adding up the total bill we will have to pay for energy... so that we, the people (and you, the individual), can make intelligent decisions on what course to take?

Everyone should become informed about the questions asked above because they have a profound bearing on the course of human civilization and what kind of lives our children's children and their children will live.

For further information

Books

1. THE CARELESS ATOM by Sheldon Novick; Houghton Mifflin, Boston, 1969, \$5.95. A careful critique of nuclear energy, as it impinges on environment.
2. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, 1969, \$2.95. See particularly M. King Hubbert's chapter on Energy Resources.
3. SCIENCE AND SURVIVAL by Barry Commoner; Viking, N.Y., 1967, \$1.35. A critique of some scientific attitudes with emphasis on the atom.
4. NUCLEAR POWER AND ITS CRITICS: THE CAYUGA LAKE CONTROVERSY by Dorothy Nelkin; Cornell University Press, Ithaca, N.Y., 1971, \$1.75.

Publications

1. MAJOR ACTIVITIES IN THE ATOMIC ENERGY PROGRAMS, an annual report by the U.S. Atomic Energy Commission. U.S. Government Printing Office, Washington, D.C. 20402. \$1.75.
2. SOURCES OF TRITIUM AND ITS BEHAVIOR UPON RELEASE TO THE ENVIRONMENT by D. G. Jacobs; AEC Critical Review Series, 1968. U.S. Atomic Energy Commission. \$3. About a dangerous by-product of nuclear fusion.
3. SEVEN WAYS TO REDUCE FUEL CONSUMPTION IN HOUSEHOLD HEATING, 1971, U.S. Government Printing Office, Washington, D.C. 20402 or Office of Consumer Affairs, Washington, D.C. 20506. 25¢.

4. ELEVEN WAYS TO REDUCE ENERGY CONSUMPTION IN HOUSEHOLD COOLING, 1971, U.S. Government Printing Office, Washington, D.C. 20402 or Office of Consumer Affairs, Washington, D.C. 20506. 30¢.

Articles

1. "The Biosphere," 11 articles on various energy and other cycles, SCIENTIFIC AMERICAN, September 1970. Also a Scientific American book published under the same title by W. H. Freeman, San Francisco, 1970.
2. "Energy and Power," 11 articles in a thorough discussion of the subject in SCIENTIFIC AMERICAN, September 1971.
3. "Nation's Energy Crisis" by John Novel Wilford, a three-part series in THE NEW YORK TIMES, July 6-8, 1971. Good summary of the situation.
4. "The Price of Power" by Anthony Wolff, HARPER'S Magazine, May 1972. An excellent, brief summary of cost-benefits.
5. "Nuclear Energy: Benefits Versus Risks" by Walter H. Jordan, PHYSICS TODAY, May 1970. A physicist's view.
6. "Costs versus Benefits of Increased Electric Power" by Philip H. Abelson, SCIENCE, December 11, 1970. The view of the editor of SCIENCE.
7. "Statement of the National Coal Association to the Senate Committee on Interior and Insular Affairs, September 10-11, 1970." Discusses uranium and other energy reserves and need for an overall energy policy.
8. "Health and Safety Aspects of Nuclear Power. Choices that Confront Us," by Sidney J. Socolar and Edward J. Friedman, March 4, 1970. New York Scientists' Committee for Public Information, 30 East 68th St., New York, N.Y. 10021.
9. "The Four Big Fears About Nuclear Power" by Ralph E. Lapp, NEW YORK TIMES MAGAZINE, February 7, 1971.
10. "AEC's New Environmental Rules for Nuclear Plants" by Robert Gillette, SCIENCE, September 17, 1971.
11. "AEC to Referee, Not Promote, Industry," SCIENCE, October 29, 1971.
12. "Reactor Emissions: AEC Guidelines Move Toward Critics' Position" by Robert J. Bazell, SCIENCE, June 18, 1971.

13. "Gofman and Tamplin: Harassment Charges Against AEC, Livermore" by Philip M. Boffey, SCIENCE, August 28, 1970.
14. "Dear Sir: Your House is Built on Radioactive Uranium Waste" by H. Peter Metzger, NEW YORK TIMES MAGAZINE, October 31, 1971.
15. "Vermont: Forced to Figure in Big Power Picture" by John Walsh, SCIENCE, October 1, 1971.
16. "The Nukes Are in Hot Water" by Robert H. Boyle, SPORTS ILLUSTRATED, January 20, 1969. A forewarning of thermal pollution ahead.
17. "Thermal Pollution and Aquatic Life" by John R. Clark, SCIENTIFIC AMERICAN, March 1969.
18. "AEC to Build a Reactor Creating Power and Fuel," THE NEW YORK TIMES, January 15, 1972. On the fast breeder nuclear reactor program.
19. "Breeder Reactors: Power for the Future" by Allen L. Hammond, SCIENCE, November 19, 1971.
20. "The Great Breeder Debate," TIMES Magazine, November 1, 1971.
21. "The Fast Breeder Reactor: Signs of a Critical Reaction" by Allen L. Hammond, SCIENCE, April 28, 1972.
22. "Power Generation: The Next 30 Years" by R. W. Holcomb, SCIENCE, 167; 159-160, 1970.
23. "We're Running Out of Gas" by Ralph E. Lapp, NEW YORK TIMES MAGAZINE, March 19, 1972. On the depletion of natural gas reserves.
24. "Power from the Sun: Its Future" by Peter E. Glaser, SCIENCE, 162; 857-861.

Films*

1. THE NATURE OF LIFE: ENERGY AND LIVING THINGS, 14 min., Coronet Films, \$175, b&w \$87.50, grades 7-12. Shows that life is a process which needs energy and involves energy changes. Enables students to follow the amount of energy which enters the atmosphere and how it is used up and changed in form.
2. PROBLEMS OF CONSERVATION: MINERALS, 16 min., Encyclopedia Britannica Educational Corporation, color \$200, b&w \$102.50. Speculates on the using up of oil and other minerals.

*Addresses of film distributors are given at the end of the guide.

Organizations

1. U.S. Atomic Energy Commission
Washington, D.C. 20545
For all inquiries related to atomic energy.
2. Joint House-Senate Committee on Atomic Energy
The Capitol
Washington, D.C. 20002
3. Radiation Office
Environmental Protection Agency
1626 K St.
Washington, D.C.. 20460
For Federal environmental regulations.
4. Federal Power Commission
441 G St.
Washington, D.C. 20426
For conventional, nonnuclear power.
5. Department of the Interior
Washington, D.C. 20240
For inquiries about energy resources.
6. Committee on Interior and Insular Affairs
House of Representatives
and/or
U.S. Senate
Washington, D.C. 20002
For questions about energy policy.
7. Atomic Energy Information Service
P.O. Box 382
Canoga Park, Calif. 91304
In New York City, call Saul J. Harris (202) 264-2513.
This is an information service for writers and researchers
in nuclear energy and radiation sponsored by the Atomic
Energy Commission, Health Physics Society, American
Nuclear Society, and Atomic Industrial Forum.
8. Scientists' Institute for Public Information
30 East 68th St.
New York, N.Y. 10021
For information about environmental effects of nuclear
power.

**ALL
THE FISH
IN THE SEA**



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ALL THE FISH IN THE SEA

Perspective

Sunday supplement writers have been fond of depicting the oceans as the last great preserve to which mankind will be able to turn in its hour of need to "farm" and harvest virtually illimitable food resources. Indeed, fish catches have expanded over the past three decades beyond the most optimistic of earlier forecasts. Where only 18 million tons of fish were taken from the oceans in the best year before World War II, the figure rose almost continuously and at a spectacular rate after the war so that in 1970 the worldwide catch had almost quadrupled the pre-war optimum. The United Nations Food and Agriculture Organization reports that 69.3 million metric tons of fish were taken in 1970, a 10 percent rise over the previous year.

The FAO Yearbook of Fishery Statistics shows that Peru was the leading producer, with 12.6 million tons, up 25 percent from 1969. Japan was second with 9.3 million tons; the Soviet Union, third with 7.3 million tons; China, fourth; Norway, fifth; the United States, sixth.

The biggest increase of fish catches in recent years has been made by developing countries. With the aid of the United Nations Development Programme, these nations have expanded their catches from 8 million tons in 1958 to 28 million tons in 1970. This places them, as a bloc, ahead of the developed market countries (with 26 million tons) and the socialist countries (15 million tons).

While these figures encourage optimism, there have been danger signals along with the increasing productivity. In 1946, the California sardine fishery slumped and has never recovered; in 1950, it was the Northwest Pacific salmon fishery; in 1961, the Atlantic-Scandinavian herring. Now the Newfoundland cod, North Sea herring and menhaden, the British Columbia herring, and the yellowfin tuna in the eastern Pacific show signs of pressure. The blue whale, the largest animal on earth, is in danger of extinction.

These fishery declines indicate that even though the world catch is greater than ever, the oceans are not as totally productive as they once were (overfishing is not the only factor in this reduced productivity; see SIX FATHONS DEEP).

The declines serve as warnings that there is a limit to the amount of fish that may be harvested without reducing the stock and producing the "golden goose" effect. In an authoritative and comprehensive study of resources by the National Academy

of Sciences, scientists have calculated what the maximum marine yield could be. It is slightly more than double the 1970 catch -- perhaps 150 to 160 million tons (predicated on the assumption, of course, that marine pollution does not cut present productivity). This would supply an extremely small percentage of the world's food energy although it could provide 30 percent of its protein requirements.

With the increasing fish catches, we are taking an ever greater percentage of "industrial" fish, suitable only for fishmeal. About half the world's catch now is processed in this way instead of being used directly for food. The dilemmas and problems of this relatively new maritime development are examined in this documentary.

The Broadcast: ALL THE FISH IN THE SEA

ALL THE FISH IN THE SEA documents the spectacular rise of Peru as a fishing nation, from 19th place to first in the world by the early 1960's, in the volume of fish caught (although not in revenue). The huge fish catch, off the West Coast of the South American country, was based on one species -- anchoveta, a small sardine which few people eat.

With the sharp rise of the anchoveta intake came a number of important ecological changes. By 1962, when Peru was hauling up 6 million tons of anchoveta per year, a new homegrown shipbuilding industry bloomed along with the fishing industry. New shipyards were turning out three vessels a day 7 days a week. Both industries meant new jobs for Peruvians. Peru also derived new income by manufacturing and selling fishmeal to the United States and nations in Western Europe. The anchoveta fishmeal became a leading export and earner of foreign exchange.

Growth was built into the process -- more boats meant more fish; more fish meant more revenue; more fish and revenue encourage more boats. By 1967, the anchoveta catch was 12 million tons a year, but with this growth came alarm signals.

One of them was a fear that the burgeoning of the fishing industry threatened one of Peru's older export industries: guano, the excrement of birds that feed mainly on anchoveta and a commodity eagerly sought as fertilizer. As it turned out, this fear was not realized. The guano fertilizer industry was able to coexist with the flourishing fishing industry.

Marine biologists sounded an even more serious warning. The anchoveta harvest would have to be cut to seven and a half million tons a year if the stock were to maintain itself. Larger profits in the short run would mean extinction of the base of the industry in the long term.

In one of the forward-looking and heartening developments of this young ecological era, Peru has instituted regulations and quotas, and the anchoveta catch in 1969 was reduced to 9 million tons a year. (The fact that the catch rose to 12.6 million tons in 1970 does not mean a relaxation of this policy. The Institute of the Sea in the Ministry of Fisheries, which closely watches the stock, decided that the larger catch was permissible without injury to the fishery.) The mistakes of overfishing committed in the Mediterranean and off the coast of Europe are not to be repeated off the coast of Peru.

Curtailment of the fish harvest led to problems. For one, the shipbuilding industry kept making boats that were no longer needed, kept increasing fish catching potential which, if utilized, would be detrimental.

The basic dilemma for Peru is that in order to get the best prices, 95 percent of the anchoveta are turned into fishmeal and most of that goes to feed cattle, pigs, and chickens in Europe and the United States; so the major portion of Peru's great protein wealth ends up as beef, pork, and poultry for protein-rich Europeans and Americans. Only 17 percent of Peru's fish protein goes to feed the hungry people of the world, and, greatest irony of all, very little goes into the bellies of Peruvians. The people of the world's leading exporter of fish protein eat less protein than peoples of all other nations except one.

As a final twist to this story, it is difficult to tempt people even in protein-short nations to eat fish protein concentrate (FPC) because the texture differs from customary staples. Some scientists now are trying to solve the riddle posed by Tristram Shandy two centuries ago -- de gustibus non disputandum, there is no accounting for taste -- by experimenting with tastier, better-textured FPC.

What can I do?

Perhaps the most important thing you can do in this case is to learn the lesson of the broadcast and take it to heart.

The Peruvian story is a parable for our times, showing first of all, how interwoven are the threads of human affairs with natural resources and the environment. Peru's economic fortunes rise, foreign interest quickens, new domestic industries flourish, another is threatened, the very base of the new wealth must be calculated, the nutrition of the people weighed against economic progress.

Secondly, the story demonstrates that there usually are no quick solutions; rather, one development leads to another complication or problem or dilemma. Protein-poor Peru's exploitation of the anchoveta fishery brings nourishment to the Peruvian economy, but the protein goes to the already protein-rich Western societies. Even when additional protein is made available, it may be rejected by a population because it does not fit into normal eating patterns.

Thirdly, there are no simple or easy solutions to many of today's ecological dislocations or abuses. On the one hand, the human population needs more food, particularly more protein; on the other, we must be more careful than we have been in the past not to kill the "golden goose" by overfishing. But we have been notably unsuccessful in showing restraint in the exploitation of a common resource. The depletion of fisheries cited in the Perspective are examples of international failure; the same failures are repeated on the intranational scale as well. Each coastal state of the United States exercises jurisdiction of fisheries out to the 12-mile limit. Fish, however, do not observe state boundaries in their migrations. New York State no longer has a menhaden fishery largely because of overfishing in Chesapeake Bay. Even within state waters a similar principle is in operation with the result -- according to Dr. John McHugh of the Marine Sciences Research Center at State University of New York, Stony Brook -- that no fisheries within United States waters are well managed.

This principle was set forth by ecologist Garrett Hardin in "The Tragedy of the Commons." Hardin chose as his "commons" a pasture shared by a number of herdsmen. Each herdsman considers adding another steer to his herd and asks what would happen if he does so. On the negative side, he reasons there would be a slight increase in overgrazing, but that would be prorated among all users of the commons. On the positive side, he would have one more fatted steer, and he alone would benefit.

The rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another...But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.

This principle can be seen at work in air pollution -- where each factory, each apartment house incinerator, each person with his automobile or air conditioner dumps his waste exhaust and heat into the common reservoir of air -- as with water pollution and solid waste problems.

In the matter of international fishing -- overfishing -- the situation is especially acute. Hopefully, a United Nations Law of the Sea Conference in 1973 can bring international order and regulations to this vexing problem.

In the meantime, there is a dearth of places even to register a meaningful protest. On the international level, write to:

Director
Fishery Resource Division
Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy

On the national level, write to the President at the White House.

For further information

(See SIX FATHOMS DEEP for information about marine pollution)

Books

1. RESOURCES AND MAN, National Academy of Sciences/National Research Council; W. H. Freeman, San Francisco, 1969. See particularly the chapter "Food From the Sea."
2. TOO MANY: A STUDY OF EARTH'S BIOLOGICAL LIMITATIONS by Georg Borgstrom; Macmillan, N.Y., 1969, \$7.95.
3. THE HUNGRY PLANET by Georg Borgstrom; Collier, N.Y., \$2.95.
4. THE PACIFIC SALMON FISHERIES, a study of irrational conservation by James A. Crutchfield and Giulio Pontecorvo. Published for Resources for the Future by the Johns Hopkins Press, Baltimore, 1969, \$6.
5. THE YEAR OF THE WHALE by Victor Scheffer; Scribners, N.Y., 1969, \$1.45. An absorbing book on the big creature.
6. THE LIFE OF THE OCEAN by N. J. Berrill; McGraw-Hill, N.Y., 1966, \$4.95. Good simple, well-illustrated account of ecology of oceans and their relation to man.
7. THE LIFE OF THE SEASHORE by William H. Amos, McGraw-Hill, N.Y., 1966, \$4.95. Ties ecology of shores to oceans and to man.

Publications

1. TOWARD FULFILLMENT OF A NATIONAL OCEAN COMMITMENT, a report by the National Academy of Engineering, Marine Board, 2161 Constitution Ave., Washington, D.C.

Articles

1. "The Ocean," 10 articles devoted to various aspects of the ocean, SCIENTIFIC AMERICAN, September 1969. Fine for information on fisheries and the rest.
2. "Crisis at Sea: The Threat of No More Fish" by Robert Brigham, LIFE, December 3, 1971. An excellent article on the problems of over-fishing and what can be done about it at the Law of the Sea Conference in Geneva in 1973.
3. "Needed: Effective Management of Our Priceless Shorelines and Estuaries," CP LETTER, May 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.
4. "Where Have the Herring Gone?" by Jean Hewitt, THE NEW YORK TIMES, February 14, 1970. On shortage of herring and other species.
5. "The Tragedy of the Commons" by Garrett Hardin, SCIENCE, December 13, 1968.

Films*

1. TOMMORROW'S WORLD/MAN AND THE SEA, 52 min., color, Contemporary Films/McGraw-Hill, \$600, rental \$35. Marine science in terms of oceanography and other aspects.
2. THE TRAGEDY OF THE COMMONS, 23 min., King Screen Productions, \$295, rental \$35, grades 7-adult. A story of what happens when people overuse a common resource.
3. THE DEEP FRONTIER, 25 min., color, Contemporary Films/McGraw-Hill, \$325, rental \$18. Exploration of the ocean floor in a deep diving submarine.

Organizations

1. Fishery Resources Division
Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy
The best source for international statistics, regulations, conventions. Virtually the world's only central agency on this subject. Some statistics and information available from FAO at United Nations headquarters in New York.

*Addresses of film distributors are given at the end of this guide.

2. National Marine Fisheries Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Washington, D.C. 20235
This agency has probably the best chance of coordinating
U.S. fishing regulations.
3. Oceanographic Institution
Woods Hole, Mass. 02543
4. Marine Sciences Research Center
State University of New York
Stony Brook, N.Y. 11790
5. Inter-American Tropical Tuna Commission
Scripps Institution of Oceanography
La Jolla, Calif. 92037
For information about tuna catches, regulations.
6. Merchant Marine and Fisheries Subcommittee on Oceanography
U.S. House of Representatives
Washington, D.C. 20515
7. Subcommittee on Oceans and Atmosphere
U.S. Senate
Washington, D.C. 20510

THE CAR IN THE CITY



73/74

THE CAR IN THE CITY

Perspective

History tells us that Morse invented the telegraph, Bell the telephone, and Edison the electric light; but when it comes to the automobile, so many men had a hand in its perfection over such a long period of time that the Encyclopedia Americana says "it seems preferable to assume the existence of an ancient dream of such a vehicle and to describe simply the principle steps of its realization." An ancient dream of a vehicle that could take men wherever they want to go on land without effort on their part or the part of animals. There have been many changes in the 20th century, but the automobile remains the darling of the transport systems, and unexcelled when one wants to travel from portal to portal in an uncongested area while enjoying personal privacy and a desirable environment.

But with today's population of autos -- still growing -- the price for these conveniences becomes ever more expensive. Is the price too high? Are cars the seeds of dissolution of our cities? While the populations of most cities have declined, suburban populations have swelled. Prosperity has gone the same way. As fast as suburban populations have grown, the populations of suburban autos have grown even faster. While the human population of Westchester County has expanded 10 percent in the past 10 years, the number of Westchester autos has increased 50 percent; in Long Island, the number of people increased 110 percent, the number of cars 193 percent.

If one automobile is beautiful, can a billion cars doom a civilization? Maps of Los Angeles show that two-thirds of the city is either roadway or parking facilities. About two-thirds of all urban air pollution is caused by autos. The growth of autos in New York City, air conditioned autos (and air conditioned buildings) has resulted in a tremendous growth in waste heat which in the summertime reminds one that the road to hell is paved with good intentions. Any solution to the problem of the auto transport system must be tempered by the knowledge that economically our society is deeply involved with that system: one out of seven workers in the United States depends on the auto industry for his livelihood; municipal, state, and Federal governments derive more than \$11 billion annually from auto taxes and highway tolls.

This leads to one of the fundamental questions facing us. Are we prisoners of our technology? Are machines meant to serve men or are men made for machines?

This broadcast does not directly investigate this basic, philosophic question; nevertheless it does point the way toward an answer as well as some pragmatic solutions to the specific question to which it is addressed.

The Broadcast: THE CAR IN THE CITY

THE CAR IN THE CITY addresses itself to the question posed by British science writer Lord Ritchie-Calder at the end of the film: are the car and the city compatible?

At the outset, college professor and transportation expert William Seifert spells out why the auto is such a popular transportation system: "The automobile is a convenient sized package. People can own them. They come in red and blue and pink. They can go when they want, they can go where they want, they can go with whom they want."

But the autos are the major source of urban air pollution and because there are so many of them, they become an increasingly ineffectual means of transportation in a city. New York City Environmental Protection Administrator Jerome Kretchmer leads a demonstration outside an auto show to impress manufacturers that "the car is strangulating the city and we want to deal with that problem."

Nader raider John Esposito says that it is natural for the auto makers to resist change, to continue to emphasize "speed, style and sex." After all, these have been selling 10 million cars a year and have put 90 million autos on the road -- nearly one for every other American man, woman, and child. Charging that this is an inefficient way to move people, Esposito calls for the immediate building of mass transport systems which are efficient, inexpensive, and nondehumanizing and also for a 10 to 15 year moratorium on building highways. "In the short run I think we are going to have to talk about limiting the use of the automobile in the inner city areas."

Helen Leavitt, author of Superhighway -- Superhoax, is another critic of the car in the city. She says that autos cause 60 percent of urban air pollution and 85 percent of the contamination in her native Washington, D.C. In addition, 60 percent of a city's central business district is devoted to highways and parking areas. Overall, this auto-space accounts for 35 percent of all urban areas -- virtually a vacuum, she says, when it comes to providing tax revenues for city dwellers. She advocates "literally banning automobiles in the city."

Fresno, California, is one city that has barred the auto from a few downtown blocks by creating a combination of modern shopping center and old village green. The question of converting to such malls confronts city fathers the world over.

With the Clean Air Act of 1970, the Federal Government ordered a 90 percent reduction of hydrocarbons and carbon monoxide by 1975 and of nitrogen oxides by 1976. A General Motors engineer, Jim Gumbleton, explains some of the steps industry is taking to meet the Federal standards.

William Lear is critical of the auto industry's campaign to clean up the internal combustion engine, charging that there is an insuperable weakness in the cleaning paraphernalia itself. He says the only way to beat auto pollution is by using an engine that is inherently clean, such as his own steam engine.

A coast to coast race sponsored by the M.I.T. Clean Air Race Committee demonstrated that while it isn't easy, a reliable, low-pollution auto engine can be built. There are alternatives to the internal combustion engine. It also showed that the university can compete with industry in developing the necessary new technology.

That still leaves the basic questions raised by Lord Ritchie Calder: Will we still want to use autos in the city in the future? Are the car and the city compatible?

What can I do?

The auto system is an extremely inefficient way to move people in an urban area. The auto uses 10 to 50 times as much land as the train. A maximum of 3,000 auto passengers an hour can move over a 12-foot-wide highway lane whereas 60,000 riders an hour can be transported by train over a similar land strip. A train moves its carload of passengers at one-tenth the expenditure of energy per passenger of an automobile.

Unquestionably, an increase in public mass transit facilities and riders is a key to improving the urban environment. Yet, with each subway and bus fare increase, the number of passengers declines leading to a loss of revenues...which is met by another fare increase, perpetuating the downward spiral in passengers. This is accompanied by deterioration of service, fewer trains or buses at off hours, and an increase in the use of private vehicles. Every city person should be aware of this cycle and understand that the spiral must be broken.

If every urban and suburban dweller's best interests lie in promoting mass public transit, a first step and basic way of doing so is to patronize it wherever and whenever possible. Campaign for new public transit facilities and against fare increases. Support bond issues for mass transit. Vote for political leaders who support public transit, who oppose fare increases, and who advocate ways to make mass transit attract more riders. Write to your congressman and senators to free the Federal highway trust fund for use in mass transit.

You can reexamine your attitude toward the automobile. Is it really necessary for your family to have two or more autos? Is it a crutch for your ego? Do you still regard it as a status symbol for yourself or somebody else? Since no one can drive fast in the city anyway, big horsepower, high compression engines are unnecessary for city driving. Various moderate speed and low polluting engines are desirable, and you can be sympathetic toward innovations in that direction.

Rome, Italy, is experimenting with a carrot-stick approach: eliminating fares on street cars and buses during rush hours and banning autos from the central part of the city. Montpelier, France, is experimenting with drive-yourself taxis. Any such thoughtful efforts deserve your consideration and, with your acceptance, advocacy for your community.

If you drive to work, go by car pool.

If you must drive, use unleaded gasoline with the lowest octane possible. Keep your car well tuned. Stop ferrying your children to their appointments -- let them cycle or walk.

Try bicycling to work or the library or other errands. Races in Washington, D.C., showed that except for main arteries, one could travel city streets faster by bike than by auto. Bicyclists now have acquired some 15,000 miles of bikeways in the United States, most of the territory recovered from the automobile. There are 61 million bicyclists, making cycling America's leading outdoor recreational pastime.

Walking, under certain conditions, also is competitive with the automobile in the city at rush hour as a means to move short distances. Walking is the most healthful mode of transportation ever invented. It should help you to live a long life, if as a pedestrian you can avoid the automobiles and their fumes.

For further information

(See also THE AIR WE BREATHE for additional information on air pollution.)

Books

1. VANISHING AIR by John C. Esposito; Grossman, N.Y., 1970, 95¢. Nader group's report on air pollution.
2. SUPERHIGHWAY -- SUPERHOAX by Helen Leavitt; Doubleday, Garden City, N.Y., 1970, \$6.95. An irate lady's case against the auto.
3. DEAD END: THE AUTOMOBILE IN MASS TRANSPORTATION by Ronald A. Buel; Prentiss-Hall, Englewood Cliffs, N.J., 1972, \$6.95.
4. THE CITY IN HISTORY by Lewis Mumford; Harcourt, Brace, N.Y., 1961, \$15, softcover \$4.95. On what a city is and what makes it that way and what cities should be.
5. THE ECONOMY OF CITIES by Jane Jacobs; Vintage-Random House, N.Y., 1969, \$1.95. The classic on the economic forces that mold cities.
6. URBAN DYNAMICS by Jay W. Forrester; M.I.T. Press, Cambridge, Mass., 1969, \$12.50. A systems analysis of why cities grow, decline, and ail.
7. THE MAGIC OF WALKING by Aaron Susman and Ruth Goode; Simon and Schuster, N.Y., 1967, \$7.50. A guide to the joys of walking.

Articles

1. "While Detroit Works to Control Auto Emissions, Others Look to Different Types of Engines and Restrictions On Auto Use," CF LETTER, April 1972. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036
2. "U.S. Agency Bars Delay on Cutting Pollutants" by E. W. Kenworthy, THE NEW YORK TIMES, May 13, 1972. Contains a good summary of the Clean Air Law.
3. "Clean Auto Engine by '75 Termed Possible by Panel," THE NEW YORK TIMES, January 6, 1972. Judgment of a committee of the National Academy of Sciences.
4. "Ford Calls Clean-Air Goal 'Impossible Task' in Cities" by Jerry M. Flint, THE NEW YORK TIMES, May 27, 1971. Henry Ford 2d says 1975 deadline cannot be met.
5. "Planners Worried by Suburban Auto Glut" by David Andelman, THE NEW YORK TIMES, January 3, 1972. Auto population explosion in suburbia.

6. "Rome to Drop Rush-Hour Fares; Plans to Bar Autos from Center" by Paul Hofmann, THE NEW YORK TIMES, March 31, 1972.
7. "Results of French Traffic Tests Fair to Muddling" by John L. Hess, THE NEW YORK TIMES, November 15, 1971. A roundup of experimental remedies.
8. "Car Engine Woes Rise," THE NEW YORK TIMES, January 23, 1972. On problems with antipollution devices.
9. "Auto Exhaust, Pollution and Weather Patterns" by Vincent J. Schaefer, BULLETIN OF ATOMIC SCIENTISTS, October 1970.
10. "Steam Bus Is Tested On Coast" by Robert Lindsey, THE NEW YORK TIMES, January 23, 1972.
11. "Jersey Orders Yearly Test for Car-Exhaust Pollution" by Ronald Sullivan, THE NEW YORK TIMES, January 7, 1972.
12. "The Little Engine That Could Be An Answer to Pollution" by George Alexander, NEW YORK TIMES MAGAZINE, October 3, 1971. On the Wankel.
13. "First 'Clean' Cars Cross West Coast Finish Line" by Gladwin Hill, THE NEW YORK TIMES, August 30, 1970. On the clean car race.
14. "Ford Capri Wins 'Clean Car' Race," THE NEW YORK TIMES, September 2, 1970.
15. "What Is the Role of the Highway in Society and the Environment?" CF LETTER, June 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.
16. "Highway Fund: In Goes Money, Out Comes Concrete" by Wade Green, THE NEW YORK TIMES, January 16, 1972. On the highway trust fund. The interstate highway system costs \$45 billion at this point.
17. "Let's Put Brakes on the Highway Lobby" by George Denison and Kenneth Tomilson, THE READERS DIGEST, May 1969.
18. "Interstate Highways: Life Changes in Their Paths" by Douglas E. Kneeland, THE NEW YORK TIMES, September 21, 1970.

Films*

1. THE POISONED AIR, 50 min., purchase Carousel, rental University of Minnesota, University of California, Pennsylvania State University, University of Arizona, Roa's Films. A CBS News production balancing the soothing views of the auto and petroleum industries with those of Senator Muskie, John Gardner, and a former Los Angeles smog control director.
2. MAN AND THE MACHINE: A ROMANCE GOING UP IN SMOKE, 15 min., Scott Foresman, \$180, rental \$20, grades 4-adult. Discusses historical development of auto, attempts to control technology with some of the more recent innovative ideas.
3. AUTOS AND ALL THAT TRAFFIC, 25 min., color, Contemporary Films/McGraw-Hill, \$350, rental \$18. Produced by CBS for 21st Century, film discusses air pollution, traffic problems, new cars to be developed.
4. BOOMSVILLE, 10 min., Learning Corporation of America, \$125, rental \$15, grades 1-9. An animated overview of the growth of cities showing what man has done to his environment.
5. AUTOS, AUTOS EVERYWHERE, 26 min., color, Contemporary Films/McGraw-Hill, University of Southern California, Indiana University, Kent State University. Cars of the future to solve today's problems. Produced by CBS for the 21st Century.
6. CITIES IN CRISIS: WHAT'S HAPPENING, 22 min., color, Michigan State University, University of California, New York University, University of Arizona. Film argues that city problems are "above all, moral"; it offers a good basis for discussion.
7. THE CITIES: A CITY IS TO LIVE IN, 54 min., color or b&w, Bailey-Film Associates or Pennsylvania State University. A broad look at cities and their evolution with such experts as Lewis Mumford and Gunnar Myrdal.
8. CITIES OF THE FUTURE, 25 min., color, Contemporary Films/McGraw-Hill, \$325, rental \$18. Discusses how growing urbanization has brought pollution, slums, congestion, and some approaches toward solutions. Produced by CBS for 21st Century.
9. Automobile Club of New York Film Library
38 West 32d St.
New York, N.Y. 10001

*Addresses of film distributors are given at the end of this guide.

Organizations

1. U.S. Department of Transportation
800 Independence Ave., SW
Washington, D.C. 20590
2. Automobile Manufacturers Association
Detroit, Mich. 48202
3. Automobile Association of America
Madison Ave. & 79th St.
New York, N.Y. 10021
4. Automobile Club of America
4 Park Ave.
New York, N.Y. 10003
5. American Petroleum Institute
Washington, D.C. 20006
6. Air Pollution Control Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
7. Department of Air Resources
Environmental Protection Administration
Municipal Bldg.
New York, N.Y. 10007
8. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
9. Citizens for Clean Air
502 Park Ave.
New York, N.Y. 10022

**YOU CAN HELP—
THROW IT HERE**



83/84

YOU CAN HELP -- THROW IT HERE

Perspective

When one thinks about it, the closed system of nature is a remarkable mechanism -- nothing accumulates out of proportion. The oceans and animals, and now man and his machines produce enough carbon dioxide for green plants which return oxygen for man, animals, and machines. The balance stays quite constant; about 21 percent of our atmosphere is oxygen, about .03 percent carbon dioxide. Whether nitrogen, phosphorous, iron, or calcium, the elements recirculate through living things and back through the air, water, or earth in what ecologists call biogeochemical cycles.

Quite literally one organism's poison is another's food. Bacteria feed on feces and cadavers, and it is fortunate for us that they do. This perfect match-up seems miraculous at first glance, but becomes understandable when one considers that billions of years of evolution have afforded the chance for many creatures to develop and make use of the earth's varied resources.

Enter man. We are creating a host of synthetic materials that are new to nature (some may have existed at one time but were discarded). Or we separate naturally occurring compounds, which may be innocuous or inert, into their components which may be dangerous by themselves; for example, taking chlorine out of salt or seawater. These substances are removed from the natural cycle. Plastics, for example, are not broken down naturally and can exist for an extremely long time. The very reason for DDT's effectiveness is that it takes so long to break down and disappear in the environment.

On the other hand, we create materials that are degradable in such quantities that natural systems are overloaded. Hence the effluvium -- smog, sewage, junk and garbage -- around our cities. We call the excess, pollution.

Also, we have a cultural value system whereby we rate objects for certain kinds of utility. We invest them with a value that can be withdrawn, modified, reinstated. The glass-shaded brass lamps popular during the age of kerosene were discarded with the advent of electricity, but later returned to countless living rooms as antiques. The horse population has been drastically reduced in the United States; where once it was a principle means of transportation and farmwork, today it is an animal used for recreation and racing. Initially, television sets were so expensive that when some part of the system failed, set owners had it restored to working order, giving birth to a vigorous television repair industry. As the price of sets came down and the costs of labor and TV repairs went up, owners reacted

to a set failure by disposing of it and buying a new one. A similar "junking" of autos occurred as the cost of collision repairs skyrocketed. Such vehicles became ineligible for resale; they were consigned to junkyards, scrap heaps, or to litter city streets and countryscapes.

If we decide something is useless, it becomes known as "waste." Waste is expelled from the human recycling system of using, buying, selling, trading, giving, and thereafter ignored. Ignored, that is, until recently, when the twin problems of waste and pollution began to interfere with the functioning of society.

Fourthly, man like other animals has ingrained habits that militate against neatness. It is not difficult to understand why. For all of time, animals have relied without realizing it on nature to get rid of whatever was unused, unneeded, or unwanted. Seeds that were not eaten took root and grew into next year's plants. In the case of our distant ancestors, who were aboreal, "The trees offered a built-in sanitation and refuse system. Whatever was discarded, it all fell neatly to the ground -- excreta, nutshells, pods, hair-droppings... On the ground below, the humbler scavengers and the processes of decay soon dissipated all such materials and returned them to the soil."¹

But as human settlements became more populous and concentrated, they began to overtax the natural processing system. Middens are prehistoric refuse heaps -- piles of bones and shells that mark where human communities once existed. These middens have proved to be treasure troves for anthropologists seeking the story of our past. They also tell us that the problem of waste disposal is probably as old as man, both having come into existence at about the same time.

The Broadcast: YOU CAN HELP -- THROW IT HERE

YOU CAN HELP -- THROW IT HERE looks at the worldwide problem of trash, junk, garbage, litter -- waste and its disposal. The questions it asks are what is it, why is it, what can we do about it?

There is an Alice in Wonderland quality to waste. It exists, we know only too well, but it could vanish like the Cheshire cat. This characteristic is alluded to at the outset by the noted science fiction writer Arthur Clarke when he says, "I don't believe in the existence of waste. There's only raw material which we're too stupid to be able to use."

¹NOT SO RICH AS YOU THINK by George R. Stewart (see Books).

Later it is brought out that we make waste, both in deciding what is valueless and therefore to be discarded and then physically taking a substance that is not objectionable in itself -- a piece of newspaper or writing paper or empty cereal box -- and mixing it with other kinds of materials in a garbage can. Then the whole melange becomes repugnant and burdensome. "What is garbage?" asks Maurice Strong, secretary-general of the United Nations' Stockholm Conference on the Human Environment. "The word garbage applies to the residues which we don't use. But when we start to use these residues, they'll no longer be garbage."

The United States, the world's most productive society, of course, also leads in the production of refuse and has not yet solved the problem of what to do with it all. Half of the waste in the United States consists of paper, one-third of the waste is some form of packaging. Most municipal refuse is burned...either in incinerating plants or in apartment house incinerators...adding, of course, to air pollution. Waste, naturally, must go somewhere. If not into air or water, then onto land. Land pollution to some extent is overcome through sanitary landfill, a method used by New York City at Fresh Kills, Staten Island. The problem with this practice is that suitable sites become filled and in metropolitan areas, such as New York City, no more landfill areas are available. Near Chicago, one ingenious solution was to build Mount Trashmore, a mountain made of garbage, for recreational ski and toboggan runs. This is only stopgap.

What must be done, and in the near future, says New York State's Commissioner of Environmental Conservation Henry Diamond, is "get as close to the closed system as possible." Virtually everything must be used again, recycled, remade, so that what is ultimate waste amounts to only 2 or 3 percent of the original. Elaborating on this theme, Maurice Strong points to the need for a new kind of information system, one which would give an inventory of the residues of one industrial operation so that they could be used as raw materials for other systems.

The Urban Refuse Research Center near College Park, Maryland, experiments with processing incinerator residues. Its research has shown that from 80 to 85 percent of the material can be reclaimed. Using conventional methods, the plant screens iron, steel, and nonferrous metals. Its researchers have made new, usable glass from waste, unusable glass; have made brick from 70 percent waste glass and 30 percent clay; and have shown that the operation can be run profitably. A number of cities have shown an interest, but the huge capital costs involved have blocked construction of such a working plant.

Other recommendations for solving the solid waste problem: more government-encouraged research, government priority to recycled materials in its purchasing policy, and a similar high-priority program by industry to use more recycled products and by-products.

That still leaves what the individual can do to help, and the broadcast looks at what one family is doing. The Wentworths have cut their garbage in half by putting such vegetable matter as lettuce, egg shells, coffee grounds, grapefruit sections, and banana peels into a compost; removing the labels from and cleaning bottles and cans, flattening the cans, collecting both separately and then recycling them both; and recycling newspapers as well.

What can I do?

In a nation and age of affluence, the old adage about "waste not, want not" seems to have been turned topsy turvy. Yet the national waste disposal bill is \$4.5 billion for municipal costs alone, a tariff of billions more is levied by air pollution, and some resources like copper already are in short supply. It is almost certainly true that the old adage holds, but we have simply not toted up the whole bill.

While the problem, like the residues, is enormous and still growing, it is important to think small. Here is an area where the individual can make a difference. Simply by doing nothing. That is, not doing something. The difference between littering and tidiness is in the individual's mind. It is a matter of attitude.. training...example...and trillions of individual decisions. Not to drop the wrapper, not to jettison the empty can from the speeding car, not to discard the no-longer-needed paper bag instantaneously, but to deposit them in proper receptacles. Instruct your children -- by example as well as edict -- not to litter.

Appreciate that the earth, all of it, is our home, the Greek oikos from which we get the word ecology. We must train ourselves to regard it as home. Take part in a block party. Lead a cleanup drive.

Having said this, having paraphrased the popular advertising slogan "People make pollution, people can stop it," let us go on to suggest that the individual is not alone in this affair. The consumer could receive a big assist from manufacturers, market people, packagers, retailers, salesmen, and advertisers. Excessive packaging is an inherent part of the blight. Nonreturnable bottles serve the convenience of the supermarket and manufacturer as well as the consumer who alone pays for the added cost. That additional cost is staggering and rarely calculated in public.

American consumers paid some \$25 billion in 1966 for packaging, 90 percent of which was discarded.² Since then, the packaging industry has grown, with entrenched interests opposed

²Bureau of Solid Waste Management, "The Role of Packaging in Solid Waste Management," Environmental Protection Agency, Washington, D.C., 1969.

to change. The purchase price of soft drinks in throwaway glass is 30 percent more expensive than when it is sold in returnable containers. It is estimated that consumers would save \$1.4 billion a year if returnable bottles were restored. It takes three times more energy to produce nonreturnable bottles, and throwaway cans are only slightly less costly in terms of energy. This is without counting the fact that consumers are forced to dispose of 50 billion bottles and cans a year and (as taxpayers) to pay for the efforts of public disposal systems.

Can we afford throwaway anything? Is the price right for planned obsolescence?

There is a very effective way to change the habits of people who sell things: that is not to buy their products. And tell them why. Conversely, help the people doing the right things -- go out of your way to buy products in returnable containers. Deliberately buy simply packaged items. Patronize a dairy that uses returnable bottles. Complain to supermarket managers about excess packaging and lack of returnable containers; persistent complaints may even be heeded.

Our shopping habits also could be reexamined. In the broadcast, New York State Environmental Conservation Commissioner Henry Diamond said almost wistfully, "When a European housewife goes to market, she might have a net bag and she gets a loaf of bread and sticks it in that and fish maybe wrapped in newspaper, and gets some fresh vegetables. She comes back and she's got very little packaging. The American housewife, in getting the same food, the same meal, comes back with plastics and cans and cardboard and that all goes out in solid waste."

Use a shopping bag.

You also can:

Recycle newspapers, bottles, cans. (But remember that recycling bottles is not nearly as efficient nor as economical as reusing returnable bottles.) If your community does not have facilities for such recycling, find out why and talk to local political leaders. Bring the matter to the attention of your local newspaper and radio station. Help start such a process.

Wherever possible, avoid use of disposable plastic and paper plates and cups. Change to china and metal utensils. Use cloth instead of paper napkins. Use old cloths instead of paper towels for cleaning. One prominent Washington lady wrapped her Christmas packages, attractively, in newspapers. Another used no wrapping -- just a ribbon. Keep a blackboard instead of a pad by the telephone for notes. Use the backs of used envelopes to make shopping lists and other notes. Write on both sides of a paper. Do not use disposable diapers. Discourage "junk" mail

by writing "return to sender" on unopened envelope. Remind yourself that paper is not free or even cheap, but comes from one of our most precious resources -- trees. Every ton of paper recycled means the sparing of 17 oxygen-producing trees.

Build your own compost heap, both as a means of garbage disposal and to provide organic fertilizer for your garden. A compost is any mixture of decomposed organic matter -- weeds, hedge clippings, leaves, coffee grounds, tea leaves, vegetable leftovers, pet droppings (but no bones or meat for they attract rodents) -- with earth and used as a fertilizing compound. A good ratio would be two parts organic matter, one part manure, one part topsoil. Compost heaps can be contained in bins, holes, trenches, trash barrels. A properly operated and located compost pile does not have an unpleasant smell. Your county agricultural agent can tell you how to make a proper compost (see For further information section).

It is important to remember that composting is simply the natural process of decay whereby decomposing organisms break down organic wastes, freeing the elements and nutrients to reenter the life cycle as they are taken up by new individuals. When we form our own compost we are simply trying to enhance the natural process. New York State's Principle Fish and Wildlife Biologist Anthony Taormina in an article in The Conservationist (see For further information section) gives these tips: The smaller the better, shredding helps; the warmer the better, 150 degrees Fahrenheit is ideal; compostables should be damp but not soggy; make oxygen available through mixing and loosening.

The United Nations World Health Organization has published the best review of the subject of commercial composting, Composting, Sanitary Disposal and Reclamation of Organic Wastes by Harold S. Gotaas.

For further information

Books

1. NOT SO RICH AS YOU THINK by George R. Stevart; Signet-New American Library, 1967, 95c. All aspects of the waste-garbage-trash-junk-litter problem.
2. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action; The American Chemical Society, Washington, D.C., 1969. Good factual information.

3. SOLID WASTES, a collection of reprints from the magazine ENVIRONMENTAL SCIENCE AND TECHNOLOGY. American Chemical Society, \$2. A good overview of recycling problems and solutions.
4. USER'S GUIDE TO THE PROTECTION OF THE ENVIRONMENT; Friends of the Earth/Ballantine, 1970, \$1.25. A list of what to -- and what not to -- buy to help the environment.
5. THE AFFLUENT SOCIETY by John Kenneth Galbraith; Mentor, 95¢. A critical analysis of a consumer society.

Publications

1. COMPOSTING OF MUNICIPAL SOLID WASTES IN THE UNITED STATES by A. W. Breidenbach, et al., U.S. Environmental Protection Agency Publication, 1971, Washington, D.C.
2. WASTES IN RELATION TO AGRICULTURE AND FORESTRY by Cecil H. Wadleigh, U.S. Department of Agriculture, Miscellaneous Publication No. 1065, March 1968. U.S. Government Printing Office, Washington, D.C. 60¢.
3. HELP. Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201. Useful do's and dont's.

Articles

1. "Bottles, Cans, Energy" by Bruce M. Hannon, ENVIRONMENT, March 1972. An excellent critique of the solid waste crisis.
2. "Solid Waste Treatment Technology" by Alex Hershaft, ENVIRONMENTAL SCIENCE AND TECHNOLOGY, May 1972.
3. "What To Do With Waste? Use It Over and Over and Over Again" by LaMont C. Cole, NEW YORK TIMES MAGAZINE, April 2, 1972. An excellent article on waste and recycling.
4. "Renewing the Soil" by Judith G. Meyer, ENVIRONMENT, March 1972. This article on composting lists all the municipal composting plants in the United States. The article is based in large part on the following paper.
5. "The Potential of Composting in Resource Recovery" by Charles Gunnerson, presented at the 137th Annual Meeting of the American Association for the Advancement of Science, Chicago, December 1970.

6. "The Art and Science of Composting" by Anthony S. Taormina, THE CONSERVATIONIST, October-November 1971. For those who want to build a compost.
7. "Composting Municipal Solid Wastes," ENVIRONMENTAL SCIENCE AND TECHNOLOGY, November 1971.
8. "Waste Recycling Effort Found to Lag" by Robert A. Wright, THE NEW YORK TIMES, May 7, 1972.
9. "Animal Polluters," TIME Magazine, September 14, 1970. On agricultural waste.
10. "The Fusion Torch. Closing the Cycle from Use to Reuse" by Bernard J. Eastlund and William C. Gough, Division of Research, U.S. Atomic Energy Commission, May 15, 1969. U.S. Government Printing Office.

Films*

1. THE GARBAGE EXPLOSION, 16 min., color or b&w, Encyclopedia Britannica Educational Corporation, Florida State University, rental \$9, grades 4-12. Presents problems, analyzes present disposal methods, explores some long-range solutions.
2. UP TO OUR NECKS, 25 min., color, NBC, Florida State University, Mass Media Ministries. NBC-TV production explores gigantic waste problem and some alternative solutions now available.
3. GARBAGE, 10 min., color, King Screen Productions, \$135, rental \$15, grades 1-12. Presents all aspects of the waste problem, but no solutions.
4. OUR POISONED WORLD -- GARBAGE, NOISE, HEAT, 30 min., Time-Life Films, \$350, rental \$30, grades 7-adult. A good introduction to title subjects.

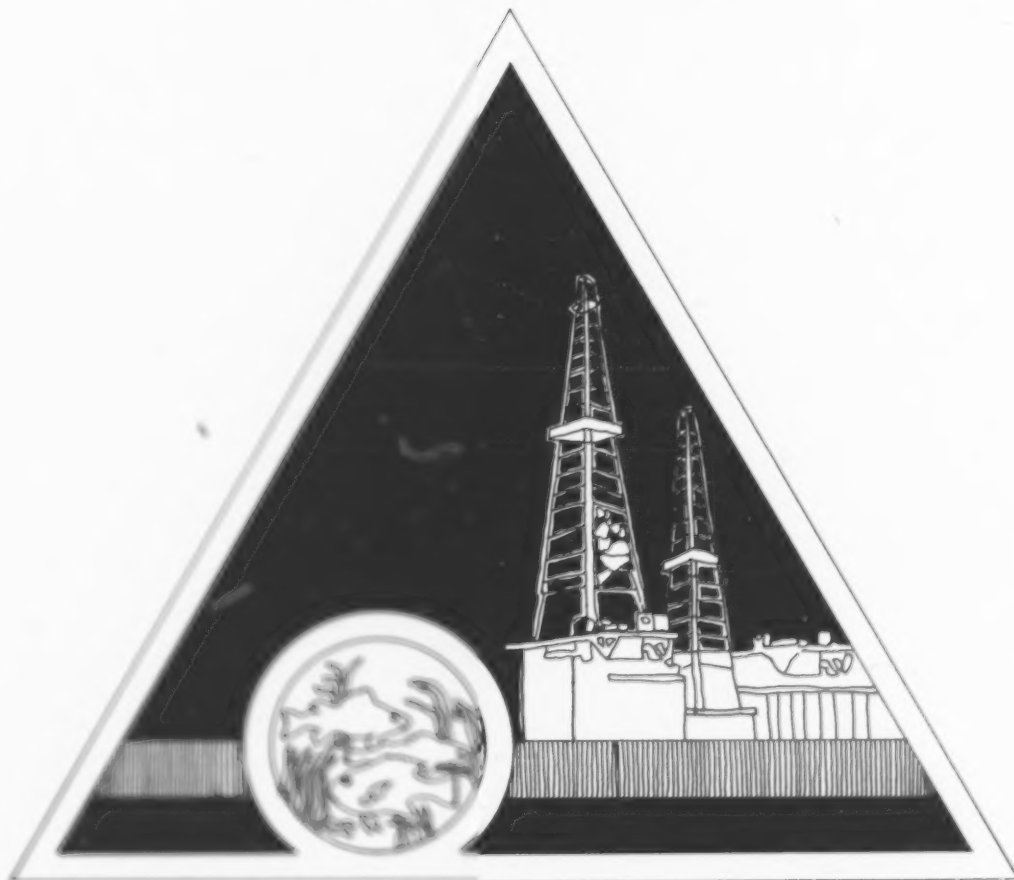
Organizations

1. County Agricultural Agent
U.S. Department of Agriculture
Cooperative Extension Service
(See U.S. Government in telephone directory for your county) For information on building a compost.

*Addresses of film distributors are given at the end of this guide.

2. Solid Waste Management Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
3. Environmental Protection Administration
2358 Municipal Bldg.
New York, N.Y. 10007
It runs the Sanitation Department and Department of Water Resources -- for information on municipal sewage or garbage treatment.
4. Office of Recovery, Recycling and Reuse
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
For information on collection and recycling programs.
5. New York State Environmental Facilities Corporation
50 Wolf Rd.
Albany, N.Y. 12201
It is designing advanced systems of waste recycling.
6. CONCERN, Inc.
2100 M St.
Washington, D.C. 20037
It publishes ECO-TIPS to guide consumers in environmentally sensible purchases at the supermarket.
7. Reynolds Aluminum and Coca Cola run recycling operations.
Check your local area.
8. Ecology, Inc.
221 Varick Ave.
Brooklyn, N.Y. 11237
This company runs a professional refuse composting operation.

SIX FATHOMS DEEP



95/96

SIX FATHOMS DEEP

Perspective

United Nations agencies divide marine pollution into five categories:

1. Disposal of domestic sewage, industrial and agricultural wastes
2. Discharge of shipborne pollutants
3. Interference with the marine environment from exploration and exploitation of marine minerals
4. Disposal of radioactive wastes from peaceful uses of nuclear energy
5. Military uses of the ocean

Of the five categories, the disposal of sewage, industrial and agricultural wastes is considered the most serious, but the pollution from oil is probably the most widespread.

Explorer Thor Hyerdahl reported on the basis of two expeditions that the North Atlantic surface current moving constantly from Northwest Africa to the Caribbean Sea is polluted by a continuity of drifting oil clots. He said that observations from the papyrus vessel Ra II showed that 2,400 miles of open ocean were contaminated with oil.

The Torrey Canyon and Santa Barbara oil spills were crucial events in the general awakening to the environmental crisis. (The Federal Government has collected \$5 million from leasing 7.2 million acres of the continental shelf for oil development and there are 16,000 oil wells off the shores of the United States alone.) Those events epitomize a central dilemma of our time. We have an insatiable appetite for energy, but now we want a clean environment, too. Can we have both?

Water, principally oceans, covers 70 percent of the earth's surface, but this covering is quite thin compared to the bulk of the globe as a whole. The oceans are far from a bottomless sewer that can absorb endless contaminants. With thousands of chemicals entering the oceanic waters, French undersea explorer Jacques Cousteau told a United Nations symposium that in the past 20 years the vitality of the seas in terms of fish and plant life has declined by 30 to 50 percent. Swiss marine explorer Jacques Piccard warned before the same body that if nothing is done, all the oceans will be dead before the end of the century. Other scientists dispute the former estimate, questioning the basis for such a comprehensive statement, and wonder at the sweeping

prediction of Piccard. Far too little is known, they say, for such judgments. At the same time, they urge caution in what we put into the oceans for the very reason that so little is known and therefore we cannot know for sure what we are doing to these great bodies of water.

Piccard estimates that from 5 to 10 million tons of oil pollution are going into the seas every year. Some 1.8 million tons, he says, come from auto exhaust emissions which rise into the atmosphere and then precipitate onto the oceans' surface. One million tons come from tanker spills. As the broadcast documents, more than half of the oceangoing cargoes now are oil. The rest of the petroleum is fed into the oceans from the world's polluted rivers.

At the same time, civilization grows ever more dependent upon energy and upon oil in particular as a source of that energy. In 1971, petroleum supplied 44 percent of the energy needs of the United States, which uses one-third of all the power produced in the world. In 1971, the United States consumed more than five and a half billion barrels of oil, an increase of 3 percent over 1970; but the most significant increase for the United States was in imported oil -- up more than 25 percent over 1970. Western Europe and Japan, the other great industrialized areas, import all their oil. Any sudden stoppage of oil supplies for any of these areas would be catastrophic.

Yet the burning of fossil fuels -- petroleum, in particular -- is a temporary phenomenon in human affairs. We are consuming petroleum at such a rate that the bulk of the world supply probably will be exhausted in a century or less. Many experts believe that this petroleum would be even more valuable to humans for its chemical qualities than for its energy component.

This perspective inevitably focuses on questions of morality. Do we have the right to consume this resource, which took eons to create, at such a rate? When X fraction of the energy is used for trivial ends? When its use compromises the integrity of the biosphere? Should some oil be conserved for our children's children and their children after them? Does posterity have any rights? Do we really know what we are doing?

The Broadcast: SIX FATHOMS DEEP

SIX FATHOMS DEEP recounts several major oil spills and some constructive responses to them. In January 1971, two oil tankers collided in San Francisco Bay, spilling nearly 1 million gallons of fuel oil. Many volunteers -- including a great number of young people, but also business executives, hard hats, families --

began a round-the-clock cleanup campaign. An oil industry anti-pollution cooperative supplied shops, supplies, and equipment. Unfortunately, the combined efforts were unable to save most oil-soaked birds.

As a result of the massive oil well blowout off Santa Barbara, California, in January-February 1969, concerned citizens organized GOO, for Get Oil Out. While the relatively small group of Santa Barbara citizens hasn't lived up to its name, a spokesman points out that only one new platform has appeared in the channel since the blowout and adds, "I do believe that if we can keep the group from becoming apathetic, which is exactly what the oil companies and the government hope we will do, that we can win the battle."

The Torrey Canyon incident off England's Cornwall Coast in 1967 signaled the first widespread alarm over oil pollution... and in fact was a key event in awakening general concern of the threat to the human environment.

New rules and regulations now under consideration by a United Nations agency which deals with seafaring matters indicates how far attitudes have changed since Torrey Canyon. The Inter-Governmental Maritime Consultative Organization intends to prohibit all intentional discharge of oil into the sea. However, the organization believes it may take until the middle or end of the decade before there will be international agreement on such a convention. IMCO also proposes that oil companies be responsible financially for cleaning up oil spills in international waters. An IMCO spokesman says the time is approaching when a ship's captain no longer will have complete freedom in choosing routes, but will have to follow instructions of a ground controller, just as an airlines pilot does now.

Controlling oil pollution is becoming an ever more difficult task. More than half of the world's sea trade now is in oil, some 600 million tons a year. The figure keeps growing. Tankers now the length of three football fields and capable of carrying 300 thousand tons of oil conceivably may be followed by tankers carrying 1 million tons of that cargo. Even though these sizes suggest possibilities of frightful spills, most pollution today comes from routine flushing of ballast tanks. A new technology is providing one effective solution to this practice -- that is, to allow the residual oil in the tanks to rise to the top, then flush out the seawater. However, all tankers are not equipped to carry out this procedure.

Recent studies by Max Blumer of the Oceanographic Institution at Woods Hole, Massachusetts, show that oil persists in the ocean environment for periods longer than had been thought previously. Biochemist David Harrison showed why much of the ocean's oil pollution may not be visible -- because it is absorbed by sand and other sediments and sinks to the ocean floor.

Controversy in Maine over whether to build a deepwater port for oil tankers epitomizes the controversy and dilemma over oil: oil production confers great economic benefits, but is becoming ever more damaging to the environment. Maine industrialist Robert Monks believes we can have the benefits without the damage by putting industry on notice that the public will not accept anything less.

What can I do?

There is only one reason why bigger and bigger tankers are being built: economics -- to cut costs, to increase profits. No other consideration, including bigger and bigger risks to the marine environment, seems to matter.¹ An Inter-Governmental Maritime Consultative Organization conference in 1973 is attempting to reduce some of the risk by requiring these huge tankers to have double bottoms (in case of collision) and two tanks (so that the entire cargo would not be lost).

If you believe that building ever bigger tankers is playing Russian roulette with the oceans, you can at least express your concern to:

Director
Inter-Governmental Maritime Consultative Organization
London, England

Chairman
Merchant Marine and Fisheries Committee
Suite 1334
House of Representatives
Washington, D.C. 20515

Chairman
Commerce Committee
Suite 5202
Senate
Washington, D.C. 20510

¹ The Torrey Canyon was a 120,000 ton "supertanker." Now, nearly 200 tankers of 200,000-ton capacity are being built, and eleven 300,000 ton vessels.

The question of marine pollution and jurisdiction was a matter of top priority for the permanent organization following up the work of the United Nations Conference on the Human Environment in Stockholm in June 1972.

A basic question is posed by the foregoing considerations. Should the economic factor be the only one or even overriding in our decisions, particularly where environmental impact is involved? Who is saving, who is profiting, if the oceans become irretrievably contaminated?

While the subject of global oil pollution is enormous and beyond the individual's reach, there are many important things the individual can do. As industrialist Monks suggested in the broadcast, fishermen and ocean bathers can report oil slicks to the U.S. Coast Guard. It is that service's responsibility to track down offenders in U.S. waters. Offenders must pay the costs of cleaning up. If you discover oil pollution occurring in any navigable U.S. waterway and can connect it to its source, report both to the nearest U.S. Attorney's office with proof -- facts, photographs, water samples. For such information you are entitled to half of whatever fine is levied after successful prosecution of the polluter (see FLOW GENTLY).

Beyond this, there is a correlation between the ever growing use of gasoline and electricity (much of it produced by burning oil) and tankers crisscrossing the oceans. How many people who came to save the oil-soaked birds arrived at the beaches in high-powered cars?

Individuals, together, can make a difference. These are some of the questions you can ask, and answer, yourself: Can our family get along with one car rather than two? Can we survive with a car with less horsepower than our present one? Is this trip necessary? Can I ride a bicycle rather than drive my car? Can I walk? Do we really need a power mower or could we get by with a hand mower? Wouldn't a bicycle do instead of a minibike, a sled or skis rather than a snowmobile, a sailboat instead of a power boat? Wouldn't we be just as happy without electric carving knives, pencil sharpeners, can openers, and toothbrushes? Is the TV set on when nobody is in the room? Is the air conditioner on full when it could be on low? Did you know that throwaway bottles, aluminum cans, synthetic fibers consume more electricity than returnable bottles, iron-tin cans, wool, and cotton? How much are you willing to give up for a clean environment? The question may become: how much will we have to give up?

The electric pencil sharpeners and electric toothbrushes use modest amounts of electricity, true, but they symbolize our disregard for energy. What is the cost of a light burning? some people ask, and answer, a penny an hour. A trifle. Well, they're wrong. The cost is precious, irreplaceable oil. The price is an ever growing stain upon our oceans. And on that scale, no one yet has calculated the bill.

For further information

(See ALL THE FISH IN THE SEA for additional information on oceans)

Books

1. THE FRAIL OCEAN by Wesley Marx; Sierra Club/Ballantine, N.Y., 1969, 95¢. On what is being done, harmfully, to the oceans.
2. OILSPILL by Wesley Marx; Sierra Club, San Francisco, 1971, \$2.75.
3. OIL AND WATER: The Torrey Canyon Disaster by Edward Cowan; Lippincott, N.Y., 1968, \$6.95.
4. THE MAGIC OF WALKING by Aaron Sussman and Ruth Goode; Simon and Schuster, N.Y., 1967, \$7.50. A complete guide to the joys of walking.
5. THE LIFE OF THE OCEAN by N. J. Berrill; McGraw-Hill, N.Y., 1966, \$4.95. Good simple, well-illustrated account of ecology of oceans and their relation to man.
6. THE LIFE OF THE SEASHORE by William H. Amos, McGraw-Hill, N.Y., 1966, \$4.95. Ties ecology of shores to oceans and to man.

Publications

1. THE SEA. PREVENTION AND CONTROL OF MARINE POLLUTION, United Nations Economic and Social Council Report E/5003, May 7, 1971. A comprehensive treatment of ocean pollution.
2. THE OIL SPILL PROBLEM, First Report of the President's Panel on Oil Spills, Office of Science and Technology. U.S. Government Printing Office. 35¢.
3. OIL POLLUTION, Report to the President by the Secretary of the Interior and the Secretary of Transportation, February 1968.

Articles

1. "Oil, Be Seeing You in All the Old Familiar Places" by Wesley Marx, SIERRA CLUB BULLETIN, September 1971. A good summary of facts and figures.
2. "The Oceans: World Sump" by Joel Hedgpeth, ENVIRONMENT, April 1970.

3. "Our Oceans Are Dying" by Jacques Cousteau, THE NEW YORK TIMES, November 14, 1971. Excerpts from testimony before the Senate subcommittee on oceans and atmosphere.
4. "We Are Killing The Sea Around Us" by Michael Harwood, THE NEW YORK TIMES MAGAZINE, October 24, 1971. On sewage, industrial wastes, and oil threatening the chemistry and vital food chains of the world's oceans.
5. "The Dirty Dilemma of Oil Spills," LIFE Magazine, March 6, 1970.
6. "Santa Barbarans Cite an 11th Commandment: 'Thou Shalt Not Abuse the Earth'" by Ross MacDonald and Robert Easton, NEW YORK TIMES MAGAZINE, October 12, 1969.
7. "Slick Off California Coast Revives Oil Deal Disputes" by Gladwin Hill, THE NEW YORK TIMES, February 2, 1972. The beginning of the Santa Barbara story.
8. "Santa Barbara, 2 Years After Its Oil Well Blowout, Still Hopes to Curb Offshore Drilling," by Gladwin Hill, THE NEW YORK TIMES, January 27, 1971.
9. "The Santa Barbara Oil Blowout and Its Aftermath -- Environmental Litigation" by Joyce P. Davis, Fordham Law School, January 15, 1971. Copy at Natural Resources Defense Council, 36 West 44th St., New York, N.Y.
10. "Tankers' Oil Spillage on Planned Alaska Route Is Estimated at 392 Barrels a Day" by William M. Blair, THE NEW YORK TIMES, February 24, 1972.
11. "Trans-Alaska Pipeline: Impact Study Receives Bad Reviews" by Robert Gillette, SCIENCE, March 19, 1971.
12. "Who Needs the Alaska Pipeline" by David Brower, THE NEW YORK TIMES, February 5, 1971. The statement of a leading conservationist.

Films*

1. SANTA BARBARA -- EVERYBODY'S MISTAKE, 30 min., color, Indiana University, \$315, rental \$11.50. Examines the whole oil spill episode, posing question why society places such a high need on oil that it willingly endangers its own life.

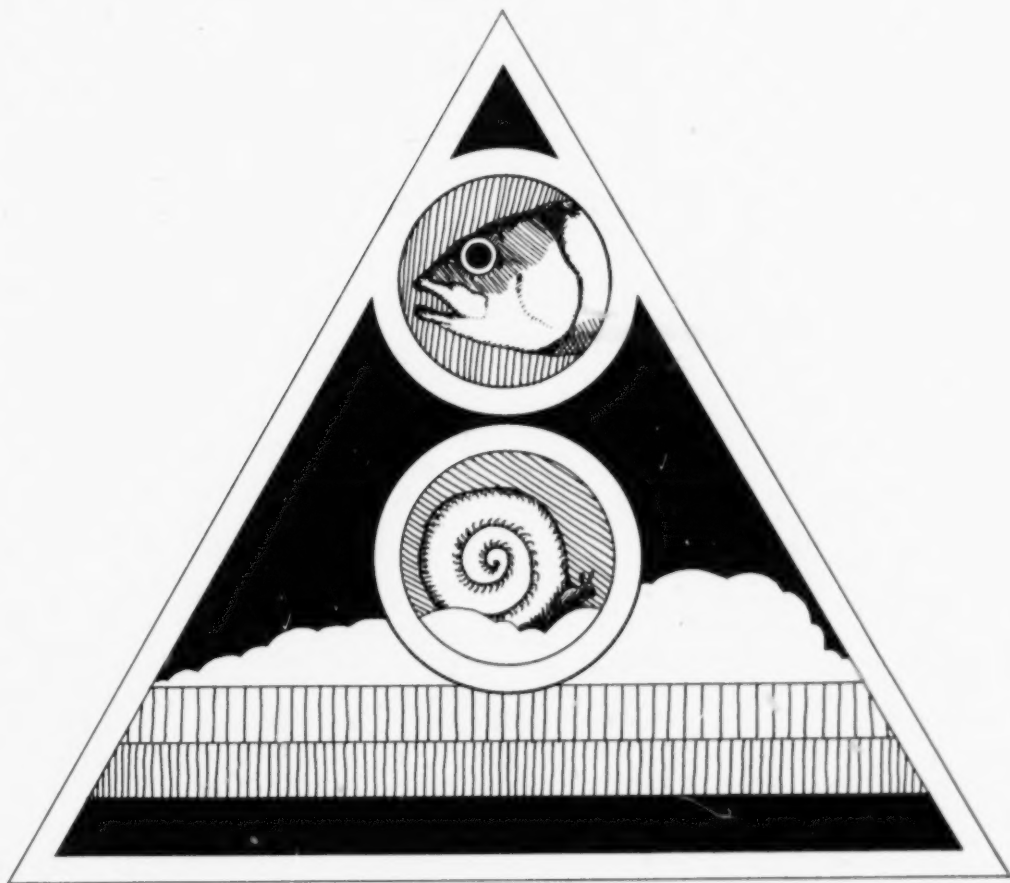
*Addresses of film distributors are given at the end of this guide.

2. TORREY CANYON, 26 min., Time-Life Films, \$200, rental \$20, grades 7-adult. A film of the Torrey Canyon disaster, the giant oil spill off England.

Organizations

1. Conference on the Human Environment
United Nations, N.Y. 10017
2. Inter-Governmental Maritime Consultative Organization
101 Piccadilly
London, England
3. Committee for the Peaceful Uses of the Seabed and Ocean Floor
United Nations, N.Y. 10017
4. Marine Sciences Research Center
State University of New York
Stony Brook, L.I., N.Y. 11790
5. American Petroleum Institute
1801 K St., NW
Washington, D.C. 20006
6. Merchant Marine and Fisheries Subcommittee on Oceanography
U.S. House of Representatives
Washington, D.C. 20515
7. Subcommittee on Oceans and Atmosphere
U.S. Senate
Washington, D.C. 20510
8. Commerce Committee
Suite 5202
U.S. Senate
Washington, D.C. 20510

**FLOW
GENTLY**



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FLOW GENTLY

Perspective

If you want to know how well or badly off a state or nation is environmentally, there probably is no better indicator than the condition of its waterways. The effort to clean up inland waters in the United States has been going on since 1948, when the first Federal legislation was enacted, with no sign of overall progress. Indeed, the situation is so confused and the information so inadequate that experts are hardpressed to tell whether water pollution is getting worse or better.¹

There have been bright spots. The four-state (New York, Pennsylvania, New Jersey, and Delaware) Delaware River Basin Commission has become a model for efforts to upgrade a river. Vigorous action under United States Attorney Witney North Seymour, Jr., in enforcing the Refuse Act of 1889 has curbed some of the pollution flowing into the Hudson River. Data being collected with permit applications submitted by some 20,000 industrial firms are giving authorities a better understanding of the pollution problem.

On the other hand, the Refuse Act -- an extremely effective antipollution statute and vehicle for direct citizen action -- is threatened (at this writing) with repeal or being bypassed by new legislation, reducing direct citizen involvement. The regulatory situation grows more confused. With the growth of the industrial economy and the human population, so grows the pollution burden.

¹The second annual report, Environmental Quality, published by the Council on Environmental Quality in August 1971 states: "Although the BOD (for Biochemical Oxygen Demand, one form of measurement of water pollution) level of wastes actually discharged has remained roughly constant in recent years, the overall quality of the Nation's waters probably has deteriorated because of accelerated eutrophication, increased discharges of toxic materials, greater loads of sediment, and other factors. The increase in these pollutants has been generated by greater use of phosphates in laundry detergents, pesticides and fertilizers in agriculture, chemicals and metals in industrial processes, and increased construction. The Environmental Protection Agency estimates that almost one-third of U.S. stream-miles are characteristically polluted, in the sense that they violate Federal water quality criteria. Less than 10 percent of U.S. watersheds were characterized by EPA regional offices as unpolluted or even moderately polluted. However, these estimates are quite subjective and are not based on actual monitoring data."

The difficulty in making progress against water pollution is understandable, and is the reason why this sector makes an accurate indicator of national will. Great sums of money are involved. In the public sector, municipalities, states, and the Federal Government must appropriate billions of dollars for all the sewage treatment plants required to clean the flow of municipal wastes. This money comes from the taxpayer. In the private sector, it becomes an additional expense when a business that has been dumping its effluent wastes into the environment free of charge suddenly must be responsible for the discharge. It costs to change an operation and to install new equipment; ditto for agricultural wastes. Just as the public expense gets back to the taxpayer, so additional business costs are borne by the consumer.

It becomes a question of how much clean water -- and to what degree clean -- are we, the people, willing to buy (and how effective we are in seeing that our elected officials carry out our wishes and see that we get what we pay for.) Up to a point. Beyond that point, it becomes a matter of survival -- when drinking water supplies become contaminated, ground water systems tainted or depleted, and clean water needed for industrial production disappears because of overdemand. A recent, extensive Federal survey revealed that 30 percent of the community water supply samples taken had excessive amounts of harmful germs and chemicals. The ground water in the Boston area is so contaminated with salt from highway deicing that it is no longer safe for persons on a salt-free diet to drink.

From the Old Mill Stream (the Blanchard River in Ohio) to the Father of Waters, the great Mississippi, and virtually every major river basin in between, America's waterways are polluted. The Mississippi now is so filthy that it may be threatening aquatic life in the Gulf of Mexico and human health in southern Louisiana.

The United States is not distinctive. Any nation that has profited from the Industrial Revolution has incurred this environmental penalty. From the Volga to the Rhine and Seine and Thames, from the Baltic Sea to the Mediterranean, water pollution plagues the industrialized societies of the western world. In the underdeveloped countries of Asia, the Middle East, and Africa, the situation is even worse. In these areas, the same river which carries off human wastes also supplies the drinking water. "A large part of the world lacks a safe water supply," said Callis Atkins, director of the United Nations World Health Organization's environmental health division. A safe water supply, he said, would prevent the spread of cholera, typhoid, and other dysenteries which are caused by contamination from human wastes.

Obviously, a body of water can be contaminated or degraded in different ways. Probably the oldest way is through sedimentation washing into streams. Billions of tons of topsoil are lost from the land masses through this process each year, but the process is accelerated wherever there is erosion, irrigation, and disturbance of land through strip mining.

The disposal of human wastes certainly goes back into prehistory as well; but the problem was aggravated, first, by the tremendous growth and concentration of human settlements and second, by the widespread adoption in this century of the flush toilet. It has been estimated that each American contributes 135 gallons of sewage daily (almost all of it is clean water that is contaminated by a minute percentage of waste). Four thousand gallons of water are needed in order to purify or dilute each individual's daily sewage. At this rate, the entire river flow of the United States would self-purify the sewage of no more than 250 million people.

Domestic waste, as it is called, not only puts harmful germs into the water, but also uses up dissolved oxygen. Fish and other aquatic life, of course, need that oxygen in order to live. Thoroughly oxygenated water carries about 10 parts of oxygen per million parts of water, but 5 ppm (parts per million) is sufficient to support most aquatic life. If the sewage overloads a river at a certain point, reducing its dissolved oxygen to 3.2 or zero ppm, then no fish nor many other life forms can survive in that section.

On the other hand, sewage usually contains high concentrations of phosphates and nitrates, substances that are fertilizers for farmlands. These nutrients, naturally, encourage water plants to grow; but they may be unwanted plants, such as certain kinds of algae, or the luxuriance of plant growth consumes great amounts of dissolved oxygen, again depriving other aquatic life of their essential oxygen supply. Once fishes and accompanying animals disappear, the ecology of the water body changes for the worse. The "enrichment" of a lake or river with these nutrients is known as eutrophication. In many respects, it is like aging, so that a eutrophic lake may be thought of as old and infirm. A limnologist, Arthur Hasler of the University of Wisconsin at Madison, estimates that one-third of the 100,000 lakes in the United States are subject to eutrophication because of the substances people have been putting into them. Runoff of fertilizers from farmlands has contributed importantly to this widespread eutrophication; so have phosphate detergents, and a number of communities and states have taken action to ban or limit phosphates in detergents.

Another broad category of water pollution is chemical, the toxic effluents from industrial plants. In terms of demand upon dissolved oxygen, industrial wastes in the United States are three times as great as domestic wastes. Agricultural wastes -- manure from cattle, sedimentary runoff, and residues from chemical fertilizers -- are still another huge contributor to water pollution.

A report by a group of ecologists, Man in the Living Environment, states that known potential supplies of phosphorous, an element essential for life, will be exhausted before the end of the 21st century.

Still another form of pollution is invisible, but tangible nevertheless. That is thermal pollution, increasing the waterway's normal temperature with the waste heat from power plants. And there is oil pollution from commerce. Hudson River shad, once a culinary delight, are no longer marketable because of their oily taste. Water bodies also pick up a considerable amount of lead and other contaminants from gasoline fumes.

It could well be that the cost of clean waters is nothing less than changing how we live: putting the goal of pure waters higher on our list of priorities than we have so far indicated we are willing to do.

The Broadcast: FLOW GENTLY

This is the story of pollution of inland waterways -- rivers, lakes, wetlands -- and the problem involved, what can be done about it and what is being done about it.

In one instance, we see the predicament of a city that wishes to clean up the industrial and human wastes it pours into a nearby river. Costs escalate with the degree of cleansed city waste fluid returned to the river. Primary sewage treatment removes only solids. Secondary treatment separates about 90 percent of the toxic material into a sludge which must be disposed of elsewhere; however, the remaining fluid going back into the river still contains substantial amounts of nitrates and phosphates which cause excessive plant growth and thus induce eutrophication in the river. Tertiary treatment, the ideal, puts clean water back into the river -- but costs are prohibitive.

Even for the lesser degrees of purification, the expenses are such that the individual city, impoverished by so many other demands for services cannot go ahead on its own resources. It must rely on state and Federal funds to pay for the greatest part of the project. As for Federal funding over recent years, performance has lagged far behind promises.

A newly discovered threat may jog lawmakers and authorities into taking more expeditious action. For the first time, viruses have been isolated in a drinking water supply. The viruses are believed to have migrated from tainted effluents through the ground water system into the drinking water.

We see the polluted Buffalo river at Buffalo, N.Y., perhaps the most heavily polluted in the United States. Stanley Spisiak, a conservationist who has observed this pollution for years, discusses the situation.

Nearby Lake Erie has been subjected to most of the ills which an industrialized society can visit on a waterway -- eutrophication, heavy sewage pollution, plus industrial poisons like mercury.

Mercury pollution is a chapter in itself. Sweden was the first nation to become alerted to this particularly hazardous form of water contamination. Swedish lakes, it was discovered when scientists deliberately began probing, registered high mercury levels caused by paper and other industrial plants. Sweden imposed severe restrictions on dumping mercury, closed many of its lakes to recreation, and embarked on what could be a century-long cleanup campaign. It may take that long for the mercury to be purged from the biological-sedimentary-aqueous environment. Canada and the United States now have committed themselves to reducing the mercury content as part of their cleanup of the Great Lakes.

Robert Boyle, author of The Hudson River, assesses the national water pollution situation.

Water pollution has been a trademark of the industrialized nations of Europe. The heavily used Rhine rises crystal pure in the Swiss Alps and descends past France through West Germany and Holland to empty its four contents into the North Sea. Once the fabled habitat of Rhine maidens, now fish have difficulty surviving in the industrial artery. In contrast, the Ruhr has been managed in a much more exemplary manner, with industrial wastes controlled, with companies charged according to how much effluent they discharge into the river. The Ruhr is a shining example that it can be done.

The Vistula River in Poland is another kind of example -- where people are trying to do it. The Vistula is a challenge. The river is badly polluted, but a cleanup campaign is underway, and so this story does not yet have an ending.

The Indus River in India presents another kind of pollution problem -- contamination from human sewage, a problem which plagues many underdeveloped countries that must rely on their river for drinking water among other things.

There is another way in which inland waters are affected by man. The building of dams can create great manmade lakes, good for fishing and recreation and for the controlled supply of water for irrigation, but these impoundments can have untoward repercussions as well. Dams can cut off the flow of rich nutrients which make so many of the world's great river valleys fertile cradles of civilization. At the same time, siltation backs up behind a dam, eventually reducing its usefulness. Lands that are not irrigated carefully can become too salty as minerals percolate upward into the topsoil. At the end of this process, the soil can become too toxic to support agriculture.

The most important health hazard is that the softly flowing waters of dammed rivers and irrigation canals are well suited for snails that are carriers of schistosomiasis in tropical areas, a debilitating disease that has shortened the lives of hundreds of millions of Africans and Asians.

What can I do?

Don't take clean water for granted. Along with breathable air, it is the most precious resource we have.

Other actions would follow from that one basic evaluation. They all add up to conservative use of water: not letting the water run continuously when washing hair or dishes or brushing teeth; fixing leaks, flushing toilets sparingly, putting a brick or two in the toilet tank to reduce water per flush. The flush toilet or water closet has been in general use for less than a century. Today, with water becoming an ever more precious commodity, our whole method of sewage disposal needs rethinking. The water serves mainly as a means of conveyance to move human wastes and secondarily as a substance for dilution. This is a wasteful use for our water and soon we may not be able to afford it. One possible substitute might be the inclusion of an individual sump in each new house or apartment to collect the human wastes. The contents would be removed periodically and since they would not be mixed with chemicals, heavy metals, and other toxic materials, the substance could be used for fertilizer.

Do not use the toilet as a trash basket. Do not use colored or bleached household papers -- facial tissues, paper towels, toilet paper; the dye and bleach pollute water and soil. Perhaps even more importantly, a boycott of these items would discourage the use of dyes in manufacturing plants where discharges have polluted adjacent waterways.

Do not use detergents with phosphate. Baking soda and a non-chemical scouring pad are good cleaning agents. Adding one-third of a cup of washing soda to about one and a half cups of laundry soap will clean moderately soiled clothes in soft water. In hard water, add one quarter cup of washing soda to the first rinse. For best results with ordinary stains, presoak in cool or warm water for 5 to 20 minutes. Beware of commercially packaged water softeners; their phosphate content often runs as high as 85 percent.

Support legislative and governmental measures to improve sewage treatment plants. Support new sanitary engineering research. Follow the actions of your representatives, legislature, administration, closely (of course, this applies to all matters of concern to you). It is not unusual for a legislature to authorize a handsome amount of funds for a project and then when many voters have lost interest or been distracted by other events to appropriate a much smaller amount. Even when a legislature does appropriate adequate funding, the executive branch may choose not to spend it. One price for environmental improvement, to paraphrase an old adage, is eternal vigilance.

The reason this is necessary is that it seems to be in the immediate, short term advantage of many special and/or business interests not to change the status quo. Public officials need constant, vocal public support in order to press and carry out economically unpalatable reforms. The uninitiated citizen must understand that lobbying represents an enormous countervailing force to public wishes expressed through elections, referendums, attending meetings, writing letters, and so forth. Lobbying is a perfectly legal and proper activity and is practiced by all organized groups that seek laws favorable to their interests, but its arena is behind the scenes and accounts for the fact that elected representatives do not always take actions consistent with the broad public interest.

The Refuse Act of 1899 is probably the best instrument a citizen ever had to take direct action against polluters. In essence, this law says that if a citizen observes industrial pollution of any navigable waterway, he can inform his nearest United States Attorney and if the polluter is convicted and fined, the citizen will be awarded half the fine. Fines range from \$500 to \$2,500 per offense, and each day could count as a new offense. One woman in New York City was awarded \$12,500 for reporting a concrete company that dumped its wastes into the East River.

Now in order to win a conviction, certain information is needed: a statement, preferably notarized, setting forth the nature of the refuse material discharged; the source and method of discharge; the location, name, and address of the company or persons causing the discharge; the name of the waterway; each date on which the discharge was observed; names of other witnesses; provide photographs of the pollution; collect the polluted water in a clean jar and seal it. If there is a university or other chemical laboratory nearby, have the contents analyzed; if not, present the jar along with the other evidence.

Now in certain cases, polluters obtain permits to pollute from the U.S. Army Corps of Engineers and are not liable to lawsuit under the Refuse Act. Water pollution regulations are in the process of change whereby all industrial polluters must file for these permits, and so direct citizen action is being phased out. An advantage of this change is that all polluters will be codified and subject to systematic remedial action, but the citizen still has to act as a watchdog of the state agency responsible for enforcement and complain to the regional Environmental Protection Agency administrator when there is no action. The citizen can also act through local watchdog groups such as the Hudson River Fisherman's Association, the Hudson River Sloop, or a chapter of the Sierra Club.

Natural Resources Defense Council in New York City is monitoring the entire water pollution regulatory process and is a good source through which to keep abreast of the current situation.

For further information

Books

1. WATER POLLUTION by Charles W. Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, \$1.68. For students (grades 7-9); with experiments. Teachers' edition also good.
2. THIS VITAL AIR, THIS VITAL WATER by Thomas Aylesworth; Rand McNally, Chicago, 1968, \$4.95. An easy introduction to the subject.
3. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action. American Chemical Society, Washington, D.C., 1969, \$2.75. Good factual material on water pollution.

4. WATER WASTELAND; A Nader group report directed by David R. Zwick, 1971. An indictment of the Federal Government's inability to control industrial pollution.
5. THE WATER LORDS by James M. Fallows; Grossman, N.Y., 1971, \$7.95. A Nader group report on industry and environmental crisis in Savannah, Georgia.
6. DISASTER BY DEFAULT by Frank Graham, Jr.; Curtiss, 1966, 75¢. Emphasizes that public apathy by the individual is a major cause of the ineffective cleanup of water.
7. THE HUDSON RIVER by Robert Boyle; Norton, N.Y., 1969. A natural and unnatural history of the river by a man who knows it exceptionally well.
8. LIFE AND DEATH OF THE SALT MARSH by John and Mildred Teal; Audubon/Ballantine, N.Y., 1969, \$1.25.
9. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, \$6.95. Contains a primer on water pollution and quality.
10. THE POLITICS OF POLLUTION by J. C. Davie; Pegasus, 1970, \$6. A good review of the Federal legislative process to achieve water pollution laws.
11. MAN IN THE LIVING ENVIRONMENT. The National Institute of Ecology; University of Wisconsin Press, Madison, 1971.
12. CHEMICAL FALLOUT edited by Morton W. Miller and George G. Berg; Charles C. Thomas, Springfield, Ill., 1969, \$22.50. Reports on mercury pollution in Sweden.
13. EUTROPHICATION: CAUSES, CONSEQUENCE, CORRECTIVES. National Academy of Sciences, 2101 Constitution Ave., Washington, D.C. 20418. Definitive scientific reports on various aspects of the subject, but heavy going.
14. THE LIFE OF RIVERS AND STREAMS by R. L. Usinger; McGraw-Hill, N.Y., 1967, \$4.95. Ecology of rivers and streams. This and the two succeeding books are clearly written, well-illustrated books from Our Living World of Nature series.
15. THE LIFE OF THE POND by William H. Amos, McGraw-Hill, N.Y., 1967, \$4.95.
16. THE LIFE OF THE MARSH by William A. Niering, McGraw-Hill, N.Y., 1966, \$4.95.

Publications

1. CITIZEN'S ACTION HANDBOOK: REFUSE ACT PERMIT PROGRAM.
Available from Natural Resources Defense Council,
36 West 44th St., New York, N.Y. 10036.
2. ENVIRONMENTAL QUALITY, the annual report by the Council
on Environmental Quality is published each August.
It contains a section on the current status of water
pollution and remedial measures. Available from U.S.
Government Printing Office, Washington, D.C., \$2.
3. MANUAL FOR EVALUATING PUBLIC DRINKING WATER SUPPLIES,
Environmental Control Administration, Department of
Health, Education and Welfare, Bureau of Water Hygiene,
Cincinnati, Ohio 45202.
4. WATER POLLUTION, a workbook published by the Scientists'
Institute for Public Information, 30 East 68th St.,
New York, N.Y., 1970, 75¢.
5. HELP. Help, Department of Environmental Conservation,
50 Wolf Rd., Albany, N.Y. 12201.

Articles

1. "New Efforts Are Being Made To Solve Our Intractable
Water Pollution Problem -- But Will They Succeed?" --
CF LETTER, July 1971. The Conservation Foundation,
1717 Massachusetts Ave., NW, Washington, D.C. 20036.
2. "Purification of Nation's Waters Expected to Be Long and
Costly" by Gladwin Hill, THE NEW YORK TIMES, March 17,
1970.
3. "Phosphate Replacements: Problems with the Washday Miracle"
by Allen L. Hammond, SCIENCE, April 23, 1971.
4. "Warning: The Green Slime Is Here" by Sherwood Davidson
Kohn, NEW YORK TIMES MAGAZINE, March 22, 1970.
5. "The Mississippi: Highway of Pollution" by Roy Reed,
THE NEW YORK TIMES, December 7, 1971.
6. "Cultural Eutrophication Is Reversible" by Arthur D. Hasler,
BIOSCIENCE, 19: 425-431, 1969.
7. "Mercury Is Heavier Than You Think" by Jay Holmes, ESQUIRE,
May 1971.
8. "Is the Mediterranean Dying?" by John Cornwell, NEW YORK
TIMES MAGAZINE, February 21, 1971.

9. "Flush Toilet Causes Growing Concern for Environment" by David Bird, THE NEW YORK TIMES, July 26, 1971.
10. "Goodbye to the Flush Toilet" by Robert Rodale, ORGANIC GARDENING AND FARMING, November 1971.

Films*

1. THE GIFTS, 28 min., color, \$114.68 from Capital Film Laboratories, free loan from Modern Talking Picture Service, but difficult to borrow because this film has received rave reviews. On the quality of water and dangers of pollution.
2. WHO KILLED LAKE ERIE?, 50 min., color, NBC, University of Arizona, University of California, University of Michigan, Florida State University. An excellent NBC-TV documentary.
3. THE RISE AND FALL OF THE GREAT LAKES, 18 min., color, Pyramid. A National Film Board of Canada production designed to stimulate discussion as well as provide information.
4. THE BEAUTIFUL RIVER, 26 min., color, NBC, Florida State University. Traces the 400 miles of the once beautiful and now despoiled Connecticut River.
5. THE PROBLEM WITH WATER IS PEOPLE, 30 min., color or b&w, Contemporary Films/McGraw-Hill. Traces Colorado River from beginning to ocean and discusses its pollution and misuse.
6. THE RIVER MUST DIE, 21 min., Shell Oil Company, free but allow 3 to 4 months for availability. Shows effects of pollutants on river, some manageable by river, some not; microphotography of biochemical effects. Pollution abatement.
7. MEN AT BAY, 26 min., King Screen Productions, \$350, rental \$35, grades 1-adult. Shows varying conflicting views of industrialist, scientist, reformer, pessimist, the unconcerned, and the alarmist over ecological problems of San Francisco Bay.
8. OUR POISONED WORLD -- WATER, 30 min., Time-Life Films, \$350, rental \$30, grades 4-adult. Uses Lake Michigan as a case in point for a study of water pollution.
9. CLEAN WATERS, 20 min., color, University of California, rental \$9. Illustrates dangers of water pollution and shows proper sewage treatment.

*Addresses of film distributors are given at the end of this guide.

10. THE AGING OF LAKES, 14 min., Encyclopedia Britannica Educational Corporation, \$167.50, rental \$9, grades 4-12. Shows eutrophication through indiscriminate disposal of sewage, fertilizers, industrial wastes. Good for introduction to aquatic study and monitoring of water quality.
11. LAKES -- AGING AND POLLUTION, 15 min., Centrol Educational Films, \$195, rental \$19.50, grades 4-12. Discusses natural aging and man-caused variety; good as a preliminary to an actual pond study.
12. PROBLEMS OF CONSERVATION: WATER, 16 min., color, \$200, b&w, \$102.50, University of Arizona, Encyclopedia Britannica Educational Corporation. Discusses problems of getting and keeping adequate fresh water supply, shows problems of Great Lakes.
13. SLOW DEATH OF THE DESERT WATER, 30 min., color, Indiana University, \$315, rental \$11.50. The dying of Pyramid Lake in Nevada.
14. RIVER, WHERE DO YOU COME FROM?, 10 min., Learning Corporation of America, \$125, rental \$10, grades 1-adult. Depicts river's origins from water evaporating from ocean's surface to its return to the sea as a rushing current. Illustrates how river serves man.
15. WHAT IN THE WORLD IS WATER?, 12 min., color, Contemporary Films/McGraw-Hill, \$165, rental \$12.50. On what water means to man in condensation, irrigation, erosion, water power. Produced by the National Film Board of Canada.

Organizations

1. Water Quality Office
Environmental Protection Agency
1636 K St.
Washington, D.C. 20460
2. Pure Waters Department
Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
3. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
The council conducts the Project on Clean Air.

4. Environmental Health Division
World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland
For facts and figures on the world drinking supply.
5. Environmental Control Administration
Department of Health, Education and Welfare
12720 Twinbrook Pkwy.
Rockville, Md. 20852
The administration has recently conducted an extensive
survey of drinking water supplies in the United States.
6. Scientists' Institute for Public Information
30 East 68th St.
New York, N.Y. 10021

STRIKING A BALANCE



STRIKING A BALANCE

Perspective

The saga of DDT is a parable of modern man. Dichlorodiphenyltrichloroethane is the most powerful weapon man ever used against his insect enemies. First, it symbolized human control of nature. Then, it became an instrument par excellence to demonstrate the ecological character of nature, to illuminate the chain of life, to inform man that everything is connected to everything else, to illustrate that the human species is a part of nature.

DDT, a chlorinated hydrocarbon, was synthesized along with thousands of other compounds by German chemists in the 19th century. The formula was filed away and forgotten because nobody knew what to do with it. Early in World War II, Britain and the United States began searching for a new insecticide. The two allies recognized that the struggle was truly global, that the Axis powers must be confronted and beaten in tropical, disease-ridden areas of Africa, the Middle East, Asia, the islands of the Southwest Pacific.

Since the days of Alexander, Caesar, and Hannibal, typhus was a more deadly killer of soldiers than any human enemy. The situation was no different early in World War II except that this time Allied warriors would be subjected to malaria and other tropical diseases as well.

Pyrethrum, a natural insecticide was fine, but not plentiful enough to meet the requirements ahead. Imagine the top secret elation in Washington and London when the Allies learned about the discovery of Paul Mueller, an employee of a Swiss pharmaceutical firm. Mueller found that the long-abandoned compound DDT was quite good at killing a variety of insects and had an extremely low toxicity for man. The compound's virtues did not end here. After intensive secret testing and then field tests, Britain and the United States began to appreciate what a marvel they had!

DDT was incredibly long lasting, eliminating the need for frequent applications; it was impressively potent against an array of insect species; and best of all, if there could be a best, it was cheap to make.

World War II was the first of man's wars in which, for the Allies at least, typhus was not a factor. DDT's impact upon malaria must be counted among the factors contributing to the

American defeat of the Japanese in the fighting on the Pacific islands. What could DDT not do in peacetime when its full potential could be exploited to benefit man! Back to back with the discovery of penicillin, an unprecedented vista of good health opened. The euphoria extended to agriculture and economic gains. In November 1944, Business Week hailed DDT in a "Report to Executives: What's Coming in Chemicals," with these words:

With such a product to stimulate additional research, mankind has new weapons promising eventual freedom from disease-bearing insects such as lice, fleas, flies, mosquitoes, and ticks; from household pests such as moths, cockroaches, and bedbugs, and from the insects that frequently kill crops, orchards, and shade trees.

Four years later, in 1948, Paul Mueller was awarded the Nobel Prize for medicine.

Fourteen years after that, in 1962, biologist Rachel Carson wrote Silent Spring. This was Emile Zola's J'Accuse in modern context. It was a detailed indictment of what was wrong with DDT and with the belief that nature could be abused with impunity. For one thing, DDT killed not only target insects, but many other kinds of creatures as well. It was particularly harmful to those animals higher on the food chains. A study of Lake Michigan showed miniscule amounts of DDT in bottom sediments, only .0085 parts per million. Tiny invertebrates concentrated the poison 48 times, .41 ppm. Fish that fed on the invertebrate animals further concentrated the DDT by a factor of 20, carrying 3 to 8 ppm in their flesh. Herring gulls which fed on the fish had accumulated as much as 3,177 ppm in their fat.

By the time Rachel Carson's book was published, agricultural chemicals were becoming a billion dollar industry. Miss Carson's charges that DDT and similar chemicals were poisoning the environment were met by a massive counteroffensive, and the war was on, raging until this day.

The basic issue for the controversy was stated in a CBS Reports broadcast, "Silent Spring of Rachel Carson." Robert White-Stevens, speaking for the chemical industry, said, "Miss Carson maintains that the balance of nature is a major force in the survival of man whereas the modern chemist, the modern biologist, the modern scientist believes that man is steadily controlling nature, that he already has disrupted the balance of nature with his burgeoning numbers, his cities, his airplanes, his roads."

In reply, Miss Carson said:

Now these people assumed that the balance of nature was repealed as soon as man came on the scene. Well, you might just as well repeal the law of gravity. The balance of nature is built of a series of inter-relationships. You can't change just one thing without changing a good many others.

Now I truly believe that we in this generation must come to terms with nature. And I think we're challenged as mankind has never been challenged before to prove our maturity and mastery -- not of nature but of ourselves.

Congressional hearings were held, but no action was taken against DDT because there was no conclusive proof that DDT was directly harmful to humans. However, over the ensuing years a more sophisticated concept competed in the public marketplace -- that human beings could be harmed if their environment were contaminated and degraded. In the years after Rachel Carson, scientists began to find that DDT was indeed poisoning our environment. Trout in New York State's once pristine Lake George no longer could reproduce because of the high levels of DDT they carried; bald eagles and certain species of hawks and peregrine falcons and brown pelicans dwindled alarmingly. An ecologist at Brookhaven National Laboratory, George M. Woodwell, predicted that continued use of DDT on a wide scale for another 25 or 50 years would doom great marine fisheries that helped to feed mankind. Coho salmon, a new sport and commercial fish implanted in Lake Michigan, were found to have 19 ppm of DDT, far above what the Food and Drug Administration considered safe for human consumption, and mother's milk was found to contain more DDT than the Food and Drug Administration considered safe, such was the extent of the pesticide's permeation.

Gradually, state and Federal governments began to curtail the use of DDT by home gardeners and moth sprayers and cotton growers. But this was not the only way that the rosy prognostications of Business Week had gone awry. Insects, species of animals that have survived on this planet for a much longer span than *Homo sapiens*, refused to succumb to the miracle weapon. Today, at least 224 pest insects are resistant to DDT and other chemical insecticides, including a number of species of *Anopheles* mosquitoes, the carriers of the malaria parasite.

The battle still rages. Modern industrialized agricultural methods are dependent upon heavy use of chemical pesticides. Large populations depend on that agriculture. A great deal of money is at stake. So is one of man's cherished dreams.

The Broadcast: STRIKING A BALANCE

DDT has been employed by man, both to improve his public health and to increase his agricultural yields. In either case, the targets of the chlorinated hydrocarbon were insects.

For many postwar years, DDT was a boon to agriculture. But the facts are that DDT is not as useful today as it once was because of the ability of insect species to develop resistance. This is a defense mechanism which has served these species well in their survival through eons of time. The application of the poison drastically alters the environment, killing great numbers of insects. There are always a few individuals with the proper genetic components or who are in some way able to withstand the poison. Naturally, these survivors propagate ever larger percentages of the insect population until after X number of generations, virtually the whole population is resistant to the toxin. Many insect species reproduce so rapidly (the boll weevil, a cotton pest, reproduces in just 3 weeks) that the protective change can be disseminated through an insect population in short order.

This is not the only thing that happens. The pesticide not only kills target insects, but their predators as well. Since predators feed on prey, it follows that there are not so many predators in the first place. In the second place, the predators usually cannot reproduce as quickly as their prey. The result is that a natural brake on the size of the target population is removed.

The Canete Valley in Peru serves as a textbook example of the diminishing usefulness of DDT and the turning to other solutions in modern farming. In 1943, before the introduction of chemical pesticides, Peruvian growers harvested 406 pounds of cotton per acre. In 1949, the first chlorinated hydrocarbons were widely used and by 1954 yields had increased to a record 649 pounds per acre. Then the trouble began. The list of pest species had grown from seven to 13 and several of these species had become resistant to DDT. By 1965, the yield in the valley had dropped to 296 pounds per acre, even with up to 25 applications of pesticides, a significant expense in itself. But now the Canete cotton growers have switched to what is known as "integrated control" of pest insects and today the yields in the valley are greater than ever before.

What is this integrated approach? First, let's ask, why are there inundations of agricultural pests? Because today's agriculture relies exclusively on what is called monoculture -- that is, planting vast areas with one type of crop in order to maximize economies of scale. This lack of diversity -- or, to look at it another way, concentration of an insect-specific

food -- naturally attracts and nourishes an unnaturally huge population of one particular species. So that insects that might otherwise occur in manageable proportions are turned into pests. In recent times, man's major response has been to use pesticides -- chemical warfare.

Scientists at several branches of the University of California have long been experimenting with a number of other ways to control agricultural pests. The most basic method would be to practice crop diversity. Even without that, there are biological controls which are predicated on studying the ecology of each insect species: seeking out predators and parasites of target insects -- many of them of exotic origin that have been inadvertently imported; manipulating planting schedules to deny a food supply at crucial times to pest populations; using sex lures to trap and destroy target insects; turning sterilized individuals loose within the pest population (after they mate, there will be no offspring); and using chemical poisons only sparingly and only as a last resort.

Ray F. Smith, chairman of the Department of Entomology and Parasitology at the University of California, Berkeley, is interviewed about this sophisticated approach to integrated control. A grape grower in the San Joaquin Valley tells of his experiences with integrated control during the past 6 years. We see experiments with integrated control in a laboratory.

In the field, oak trees are sprayed with bacteria to kill oak moths, a strategy which may be effective against the gypsy moth. Another field experiment concerns the synthesizing of a sex lure to trap bark beetles which are destroying pine trees in the western United States. Imported Australian ladybugs and lacewings are used to combat the psyllid which is attacking acacia trees in California.

Paradoxically, today's modern agriculture has become more dependent than ever upon DDT and the battery of chemical pesticides. The so-called "Green Revolution" has accentuated this tendency. In this type of agriculture, the farmer cultivates certain genetic strains of wheat or corn or rice which provides extraordinarily abundant yields but which are extremely vulnerable to pest insects or other blights. They cannot prosper without the chemical shield. The United Nations Food and Agriculture Organization, a stout defender of DDT, says, "Until cheap, safe and efficient substitute pesticides are produced and made easily available, there is no alternative to the judicious use of DDT, especially in the developing world to increase agricultural productivity to feed growing numbers of people on our planet."

To annotate that statement, it should be pointed out that the quantum jump in food production provided by the Green Revolution is expected to avert the widespread famine predicted for the 1970's and 1980's, and to keep food supply abreast of the rising human population until the end of this century. In other words, it has provided time to arrive at a solution to the human population problem.

Norman Borlaug, who is known as the father of the Green Revolution and who was awarded the Nobel Prize in 1970 for his work in developing new wheat strains has been outspoken in the DDT controversy. Borlaug has censured what he called "irresponsible environmentalists." If agriculture is denied the use of these chemicals, Borlaug says, "because of unwise legislation that is now being promoted by a powerful group of hysterical lobbyists who are provoking fear by predicting doom for the world through chemical poisoning, then the world will be doomed not by chemical poisoning but from starvation."

David Brower, perhaps America's foremost conservationist, takes an opposing view and the film provides a dialog between the two men. The World Health Organization's Martin Kaplan takes a more middle ground. Advocating the use of DDT -- in this case in the battle to control malaria -- nevertheless he concedes the chemical's destructiveness to wildlife, acknowledges that we aren't sure what DDT may be doing to the human population even though no direct harm has been proven, and says there is need for more research.

The long-lasting quality of DDT -- its ability to persist in the environment for a long period of time -- is its crucial characteristic in the campaign against malaria. The insecticide's durability means that an area must be sprayed only once or twice a year. It is not necessary that the female *Anopheles* mosquito which transmits the malaria parasite be sprayed directly. The mosquito usually rests on walls or ceilings before and after feeding on its human host. If these surfaces are coated with DDT, the mosquito picks up small particles of the insecticide on its feet and is poisoned before the parasitic malaria can be transferred. In this way, the malaria cycle is broken and a way is opened to eradicate the disease.

Nations with upwards of 1 billion people fought and successfully reduced malaria in campaigns begun after World War II. The World Health Organization has been and remains today one of the staunchest champions of the use of DDT. In April 1951, the American Journal of Public Health cited figures of reduced malaria cases in country after country and said editorially: "This is one of the most dramatic and significant chapters in the entire history of public health." In Ceylon, there were nearly 3 million cases of malaria in 1948. By 1963, the number

had been reduced to just 17 new cases. After that year, the use of DDT was abandoned (Ceylon thought the battle was won) and by 1968 the figure once again had reached the proportions of two decades earlier. With renewed DDT campaigns, the figure has dropped in recent years.

Few persons have condemned the use of DDT against malaria, but the ultimate answer must come through an ecological approach which would include selective draining or water management, selective use of pesticides, and biological controls based on continuing research. Not only does DDT contaminate the environment, but it is gradually producing populations of resistant mosquitoes impervious to the insecticide -- malarial time bombs for future generations.

What can I do?

In general, as backyard gardeners and householders we can learn to deemphasize our reliance on chemical poisons. The sophisticated citizen realizes by now that such substances are insistently thrust into our attention not because they are necessarily the best way to deal with farm and garden problems, but because someone is making money from them. Robert van den Bosch, an entomologist at the University of California at Berkeley, compares the chemical pesticide salesman to the patent medicine man of another era. "The salesman is the key to the system, for he serves as diagnostician, therapist, and pill dispenser. And what is particularly disturbing is that he need not demonstrate technical competence to perform in this multiple capacity."

The hazards in the use of pesticides are now widely recognized, as evidenced by the recent restrictions on their sale and use. Beginning in 1973, DDT is banned in the United States for virtually all uses.

In New York State, the Department of Environmental Conservation, which administers the pesticide control laws, has classified pesticides into several categories, as follows:

- a. Pesticides which "may be distributed, sold, purchased, possessed and used only upon issuance of a commercial or purchase permit for any uses listed on the approved label as registered with the New York State Department of Environmental Conservation."
- b. Pesticides which "may be distributed, sold, purchased, possessed or used only upon issuance of a commercial permit or purchase permit for those purposes listed."

- c. Pesticides for which "no permitted uses will be allowed."

The "c" list of pesticides which have no permitted uses includes DDT, benzene hexachloride (mixed isomers), DDD, TDE, Endrin, mercury compounds, Selenites and Selenates, Strobane, Thallium, Toxaphene, and Bandane.

Most of the other chlorinated hydrocarbons, organic phosphates, and carbamates appear in the other two lists (a) and (b), with their sale, purchase, and uses so highly restricted that they are unobtainable by the ordinary citizen, and cannot be legally used except for an extremely limited number of applications.

The listings are, of course, subject to change according to new research findings, and with the development of new and safer pesticides.

Among the better-known pesticides not subject to the above restrictions, because of their relative safety in the environment when used as directed are methoxychlor, malathion, carbaryl, and plant derivatives such as rotenone, pyrethrins, sabadilla, and related materials.

It is interesting to note that nicotine compounds, also of botanical origin, are highly restricted because of their poisonous nature. Also, a word of caution on the "new" ideas such as sterilants, sex attractants, fungus spores such as milky disease against Japanese beetles, and bacterial sprays such as Bacillus thuringiensis against gypsy moth and other caterpillars. These have to be tested with as much care and thoroughness as the chemicals, and cannot be used indiscriminately. Some are quite specific, others are not, and there are many other dangers that must be eliminated before any of these methods should be used, such as the presence of other, possibly harmful bacteria, and deterioration or breakdown of the materials which might result in harmful effects.

It takes as much time and trouble and money, usually more, to screen these materials than it does for chemicals. This is, of course, a principal reason why they are slow to come into general use. Also, as with chemicals, either they must be profitable to make and market, or the government (you, the taxpayer) must subsidize their manufacture, and the research that goes into making them effective and safe.

All this emphasizes what has already been pointed out -- "natural" control is the best control -- that is, insofar as

possible plant, cultivate, and live so as to make pesticides unnecessary, or, to the extent that is not possible, use them intelligently and sparingly.

You can set traps, rather than poisons, for rodents. Aphids and leafhoppers can be removed from plants, for instance, by water blasting, but you must use the hose every morning. You can buy natural predators such as ladybugs and lacewing larvae for aphids; praying mantis for aphids, whiteflies, spider-mites; trichogramma wasps for cabbage loopers and other caterpillars. Pyramid Nursery, Box 5270, Reno, Nevada 89503, and Rincon Insectary, 1462 Callens Road, Ventura, California 93003, are two places that sell such predators. There are others. Montgomery Ward sells organic gardening garden supplies.

Diversify your planting. Make your backyard area attractive for birds with trees, shrubs, feeders, baths; many birds feed on insects. Encourage lizards, toads, snakes, and salamanders by placing two or three flat boards on the ground. These creatures eat slugs, snails, centipedes, beetles, aphids, termites, ants. Don't kill spiders; they eat insects. Try pulling weeds manually rather than using herbicides. You can kill weeds near sidewalks and driveways by pouring boiling water on them. Don't be upset by a few insects and insect holes in your plants.

For further information

Books

1. SILENT SPRING by Rachel Carson; Crest, Fawcett Publications, Greenwich, Conn., 1962, 75¢. The classic that started it all.
2. SINCE SILENT SPRING by Frank Graham, Jr.; Houghton Mifflin, Boston, 1970, \$6.95. The Rachel Carson story and what happened after publication of her best seller.
3. PESTICIDES AND THE LIVING LANDSCAPE by Robert L. Rudd; University of Wisconsin Press, Madison, 1964, \$1.95. Another SILENT SPRING with more documentation.
4. CHEMICAL FALLOUT edited by Morton W. Miller and George G. Berg; Charles C. Thomas, Springfield, Ill., 1969, \$22.50. The document of a conference attended by Swedish scientists who came to tell American colleagues about the evils of mercury poisoning and learned themselves about DDT. The book also contains the arguments of scientists who discount the evils of DDT.

5. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER AND AIR GONE by Osborn Segerberg, Jr.; McKay, N.Y., 1971, \$2.95.
6. PEREGRINE FALCON POPULATIONS: THEIR BIOLOGY AND DECLINE edited by J.J. Hickey; University of Wisconsin Press, Madison, 1969.
7. HARVEST OF DEATH, Chemical Warfare in Vietnam and Cambodia by J.B. Neillands, et al.; Free Press, N.Y., 1972, \$10. The story of defoliation as seen by five scientists.
8. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, \$6.95.
9. IF YOU WANT TO SAVE YOUR ENVIRONMENT...START AT HOME by Carroll Harrington, et al.; Hawthorn, N.Y., 1970, \$2.50.
10. THE ENVIRONMENT, THE ESTABLISHMENT AND THE LAW by Henkin, Harmon, et al.; Houghton Mifflin, Boston, 1971, \$4.50. The DDT case as fought before a state body in Wisconsin.

Publications

1. PESTICIDES, 1970, a workbook prepared by Scientists' Institute for Public Information, 30 East 68th St., N.Y. 10021. 75c.
2. ECOLOGICAL EFFECTS OF PESTICIDES ON NON-TARGET SPECIES by David Pimentel; June 1971, Executive Office of the President, Office of Science and Technology. Obtainable from U.S. Government Printing Office, Washington, D.C. 20402. \$2.

Articles

1. ENVIRONMENT Magazine devoted most of its December 1969, issue to DDT and includes a chart of insects that have developed resistance to DDT and other pesticides.
2. "The Pesticide Syndrome -- Diagnosis and Suggested Prophylaxis" by Richard L. Coutt and Ray F. Smith; paper, American Association for the Advancement of Science Meeting, Boston, December 1969.
3. "The Developing Program of Integrated Control of Cotton Pests in California" by Robert van den Bosch, et al.; A.A.A.S. Meeting, Boston, December 1969.

4. "Pesticides in the Estuary" by Philip A. Butler, U.S. Bureau of Commercial Fisheries, Contribution No. 85, from a symposium held at Louisiana State University, July 19-20, 1967.
5. "DDT in the Biosphere: Where Does It Go?" by George M. Woodwell, Paul P. Craig, and Horton A. Johnson, SCIENCE, December 10, 1971.
6. "Report of the Secretary's Commission on Pesticides and their Relation to Environmental Health," a Department of Health, Education and Welfare publication discussing DDT residues in man. U.S. Government Printing Office, Washington, D.C. 20402.
7. "Chlorinated Hydrocarbons and Eggshell Changes in Raptorial and Fish-eating Birds" by J.J. Hickey and D.W. Anderson, SCIENCE, 162, 271-3, 1968.
8. "DDT Residues in Pacific Sea Birds: a persistent insecticide in marine food chains" by Robert Risebrough, et al.; NATURE, 216, 589-91, 1967.
9. "Toxic Substances and Ecological Cycles" by George M. Woodwell, SCIENTIFIC AMERICAN, 216, 24-31, 1967.
10. "DDT Reduces Photosynthesis by Marine Phytoplankton" by Charles F. Wurster, SCIENCE, 159, 1474-5, 1968.
11. The petition brought by the Environmental Defense Fund, Sierra Club, West Michigan Environmental Action Council, and National Audubon Society to prevent the Secretary of Agriculture from authorizing further use of DDT contains an extensive bibliography of the scientific literature.
12. "The Green Revolution: Cornucopia or Pandora's Box?" by Clifton R. Wharton, Jr., FOREIGN AFFAIRS, April 1969.
13. "Mankind and Civilization at Another Crossroad" by Norman E. Borlaug; McDougall Memorial Lecture, 1971, United Nations Food and Agriculture Organization.
14. "Man and His Environment -- Crisis or Challenge?" by Earl L. Butz; AGRICULTURAL CHEMICALS 26 (6): 12-13.
15. "Eagles, Affluence and Pesticides" by Andrew J. Rogers, Presidential Address, American Mosquito Control Association, April 24, 1972. Obtainable from Dr. Rogers at West Florida Research Laboratory, Panama City, Florida 32401.

Films*

1. SILENT SPRING OF RACHEL CARSON, 54 min., b&w, Contemporary Films/McGraw-Hill, \$275, rental \$15. The classic confrontation of Miss Carson and the agricultural chemical industry over DDT.
2. POISONS, PESTS AND PEOPLE, 58 min., b&w, Contemporary Films/McGraw-Hill, \$350, rental \$25. Examines effects of widespread use of chemical insecticides on insects and on warm-blooded creatures; also, discusses alternatives. Produced by the National Film Board of Canada.
3. THE POISONED PLANET, 19 min., Contemporary Films/McGraw-Hill, \$260, rental \$24, grades 7-12. Produced for ABC-TV, film explores widespread use of chemical pesticides.
4. OF BROCOLI AND PELICANS AND CELERY AND SEALS, 30 min., color, Indiana University, \$315, rental \$11.50, grades 4-adult. DDT moving up the food chain off California coast, pelicans unable to hatch young. Produced by National Educational Television for Our Vanishing Wilderness series.
5. THE CHAIN OF LIFE, 30 min., color, Indiana University, \$315, rental \$11.50. The food chain of life and what chemical pesticides do to it. From Our Vanishing Wilderness series produced by National Educational Television.
6. DDT/SOS, 30 min., color, WCBS-TV News, free. A discussion of marine pollution.
7. THE WINNERS, 30 min., color, Contemporary Films/McGraw-Hill, \$350, rental \$18. Film shows why insects are successful, their diversity and remarkable adaptability; explains how and how not to control them.
8. OUR POISONED WORLD -- PESTICIDES, 30 min., Time-Life Films, \$350, rental \$30, grades 4-adult. Concentrates on biological magnification of persistent pesticides through food chain.
9. THE AMERICAN BALD EAGLE, 16 min., Coronet, color \$195, b&w \$97.50, grades 4-college. Relates endangered species to activities of man. From film produced by Laboratory of Ornithology, Cornell University.

*Addresses of film distributors are given at the end of this guide.

10. THE FOOD REVOLUTION, 26 min., color, Contemporary Films/McGraw-Hill, \$350, rental \$18. On the Green Revolution and new methods to synthesize food. Produced by CBS for the 21st Century.

Organizations

1. Pesticides Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
2. Council on Environmental Quality
722 Jackson Pl., NW
Washington, D.C. 20006
3. U.S. Department of Agriculture
The Mall, between 12th and 14th St., SW
Washington, D.C. 20250
4. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
5. National Audubon Society
1130 Fifth Ave.
New York, N.Y. 10028
6. Environmental Defense Fund
162 Old Town Rd.
East Setauket, N.Y. 11733
7. World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland
8. Food and Agriculture Organization
Via delle Terme di Caracalla - 00100
Rome, Italy
9. U.S. Department of Health, Education and Welfare
330 Independence Ave., SW
Washington, D.C. 20201
10. American Association of Economic Entomologists
4603 Calvert Rd.
College Park, Md. 20740

11. American Mosquito Control Association
P.O. Box 278
Selma, Calif. 93662
12. State Agricultural Experimental Stations or State
Agricultural Colleges in all states.

THE AIR WE BREATHE



THE AIR WE BREATHE

Perspective

Like the fishes, we terrestrial animals live in an ocean; but, of course, our medium is air.

It is also a sheltering sky.

In both capacities, the marvelously variegated and complex atmosphere sustains life.

What we call the atmosphere -- all the gaseous matter surrounding the earth -- has been divided into a series of spheres, one enclosing the other until we get far out into space. At the bottom and extending upwards for 10 miles is the troposphere or turning, changing sphere. This is the sphere we live in. It contains 80 percent of the gaseous material, the weather and pollution, and is in continual movement -- fortunately, for this is an important cleansing mechanism. Lying on top of the troposphere is the extremely stable stratosphere, or stratified sphere. Most of the remaining gases are in the second 10 miles above the earth's surface, so that 99 percent of all the gaseous matter exists in a 20-mile band. The stratosphere, or what some people call the lower stratosphere, extends from 10 miles to 30 miles in altitude. Temperatures gradually increase as we ascend so that at the 30 mile level the temperatures are close to what they are at the earth's surface.

In the upper stratosphere, the temperature begins to drop until an altitude of 50 miles, an area called the mesosphere is reached and then rises in the thermosphere to fantastically high temperatures, reaching 2,250 degrees Fahrenheit at 300 miles. Above this level, particles are so thinly distributed that upward-moving molecules may escape from the earth's gravitation, and so this region is called the exosphere. Electrically charged molecules range into space as far as 50,000 miles from earth.

The atmosphere is hit constantly with ultraviolet rays, which are lethal to life. From 75 miles down to 30 miles, some of the short wavelength ultraviolet light is absorbed by oxygen molecules, splitting the O_2 into single atoms. Some of these atoms are absorbed into the oxygen in the 10 to 30 mile layer, forming O_3 or ozone. Ozone absorbs the deadly ultraviolet light, at the same time absorbing heat. With the stratosphere warmer than the upper levels of the troposphere, we have a mammoth inversion, so that in a sense the troposphere is trapped beneath the stratospheric ceiling.

There is another trapping mechanism at work. The solar radiation that passes through the atmospheric screen is re-radiated off the earth's surface and would escape back out into space except that about two-thirds of this heat-energy is caught by water vapor and carbon dioxide, and some of it once again is sent earthward. Because of this so-called "greenhouse effect," our temperature on earth is 65 degrees F. warmer than it would otherwise be.

This then is our ocean, composed of 78 percent nitrogen, 21 percent oxygen, with argon, neon, helium, krypton, xenon, hydrogen, methane and nitrous oxide making up the other permanent gases -- all in an almost perfect mix. There also are variable atmospheric gases -- water vapor, carbon dioxide, ozone, sulphur dioxide, and nitrogen dioxide.

Life as we know it today has adapted itself to the remarkably consistent conditions of this sheltering sky. The ratio of the oxygen (21 parts per hundred) to carbon dioxide (300 parts per million) in the atmosphere apparently has remained constant for eons -- the plants taking the CO₂ and capturing the sun's energy through photosynthesis and providing animal life with oxygen and food and the animals, in turn, replenishing the CO₂.

Man has triggered enough alterations in the atmosphere to cause some scientists to wonder, and some to worry. Will SST's flying in the stratosphere rip open the ozone shield to allow blinding, killing ultraviolet light to pour through? Will an increase in carbon dioxide trap more heat, melting the polar icecaps, raising the oceans, flooding coastal cities? Actually, our average temperature has cooled by one-half a degree since 1940. Could this be because of more particulates -- pollution in the air? our shroud?

Modern man's lungs are black from the soot and filth in his air. His blood carries airborne lead, his fatty tissues, airborne DDT. Bronchitis, asthma, emphysema, asbestosis, and lung cancer are modern epidemics plaguing urban man. Emphysema has doubled every 5 years since World War II. Lung cancer, once a rarity, now kills more people than all other cancers combined. Air pollution "episodes" have killed outright. In Donora, Pennsylvania, in 1948 almost half of the town's 14,000 inhabitants fell ill and 20 died. In London in 1952, during one period lasting several days, 1,600 more deaths occurred than would normally have taken place.

The Broadcast: THE AIR WE BREATHE

The broadcast opens dramatically with the sound of breathing as we see scenes of air pollution -- a vivid reminder that we cannot inhale filth without injury to ourselves.

Dr. Stephen Ayres, director of the cardiopulmonary department at New York's St. Vincent Medical Center, confirms this impression. "We do know that air pollution at certain levels can injure the lungs and perhaps other body tissues," he says, and then adds: "We've identified the health effects of air pollution to rather accurate degrees. We really haven't done a very good job in control."

The broadcast then establishes that the automobile is the single most important cause of air pollution, causing 60 to 80 percent of the contamination in many cities. There are various efforts to control the pollution -- stringent emission control standards, careful carburetor regulation, spot road checks in Japan and, of course, the Clean Air Law in the United States designed to make new cars manufactured in 1975-76, 90 percent cleaner than those of 1970. However, the number of cars on the road keeps increasing, and it can be said that the problem of auto pollution is far from solved. Robert Rickles, former New York City Air Resources Commissioner, says, "Obviously all the people who sell gasoline, who sell cars, who sell concrete, sell steel are all in favor of more roads and less, or not so much, mass transit. But I think public opinion is swinging very much against them. So that I think that we will see a great deal more money spent in mass transit."

Refineries, mills, mines, the heating of homes and factories, incinerators and, particularly, electric utilities also produce air pollution. Charles Luce, board chairman of New York's Consolidated Edison Company, points out that more mass transit, greater treatment of sewage, and recycling of junked autos require more electricity, so the dilemma is that in order to purify the environment in other ways means more electricity with its impact on the environment. One way, or at least part way, out of this dilemma, Luce says, is: don't waste electricity...or oil or gasoline or coal or any other form of energy. He says a campaign by his company to conserve electricity has shown results.

Vincent Schaefer, a meteorologist with the State University of New York at Albany, suggests that conventional smokestacks be replaced with horizontal ones shaped like pretzels or corkscrews so that the waste particles fall down and are removed by conveyor belt without being spewed into the atmosphere where they can remain for a month and circumnavigate the globe.

On the subject of human health, Ayres suggests that one reason cigarette smoking may be so harmful is that air pollutants are drawn through the cigarette's hot zone, thus creating exotic chemical vapors that the lungs are not accustomed to processing. Asbestos is another dangerous airborne contaminant, one closely

linked to lung cancer. Asthma, bronchitis, and lung diseases are common to the industrialized cities of the world.

"People want to be healthy," Ayres says, "and I think until very recently everyone thought that all that was needed was perhaps a few tablets, a pill once in a while and good health was guaranteed. We know now that adequate diet, adequate exercise, and a reasonably clean environment are absolutely necessary to have decent human health. If we can hammer that message home that clean air means good health, and dirty air means bad health, we will have accomplished a great deal."

Schaefer adds that if the individual wants to make a contribution in eliminating or alleviating air or any other kind of pollution, he must become educated to understand what the problem is. In the long run, we, the people, are the ones who have to make these decisions and our industrialists, in one sense are merely our servants, just as public officials are our servants. "I think that the sooner the general public of the world understands this, that we are all in this together, and that somehow or other we have to find a better way, then I think we will begin to solve some of the problems, and not until then."

Finally, Maurice Strong, Secretary-General of the United Nations Conference on Human Environment, explains that all life on the planet is dependent upon the delicate balance of the heat we receive from the sun and the amount of heat reflected back into space, which is regulated by the filtering quality of the atmosphere. Tampering with that atmosphere can lead to destruction -- and no one knows for sure just what we are doing in this area. Air pollution, he reminds, recognizes no boundaries and the United Nations "is the only global organization that can deal with this problem on an overall basis."

What can I do?

Don't smoke.

More than 280 million tons of pollutants are pumped into the air over America each year. More than half of this contamination consists of extremely lethal carbon monoxide. The second major air pollutant is highly dangerous sulphur dioxide, followed by hydrocarbons, particulates, and nitrogen oxides. Subject to sunlight, the nitrogen oxides combine with gaseous hydrocarbons to form a complex variety of secondary pollutants called photochemical oxidants. These oxidants, with particulates, make up what we know as smog.

Transportation, mainly auto emissions, accounts for more than half of these pollutants -- nearly two-thirds of the carbon

monoxide, nearly half of the hydrocarbons, more than one-third of the nitrogen oxides. In cities, these percentages go up 50 to 100 percent. It is obvious that measures taken to reduce driving autos and increase public transportation are the most effective individual/collective responses to air pollution (see What can I do? sections of THE CAR IN THE CITY and SIX FATHOMS DEEP). This is particularly true in urban areas where carbon monoxide levels at times exceed the danger point, where residents carry higher burdens of lead in their blood, and where lung ailments are so common.

Electric power plants are the major producers of sulphur dioxide and along with other fuel burners produce most of the rest of the nitrogen oxide pollution. Cutting our demand and use of electricity will bring a bonus of cleaner air to us as individuals and as a group (see the What can I do? sections mentioned above). Review all your uses and dependencies on electric power; then consider how many you can forego without great inconvenience and how many you can find substitutes for (wearing a sweater around the house will conserve coal and heating expenses as well).

The 1970 Clean Air act authorizes citizen suits in order to enforce provisions of the act. For a copy of the act, write to Office of Air Programs, Environmental Protection Agency, Washington, D.C. The Natural Resources Defense Council is monitoring the implementation and enforcement of the act in conjunction with the Scientists' Institute for Public Information with a Project on Clean Air, and can be consulted for current information.

Finally, "It is better to light a candle than to curse the darkness." Plant a tree.

For further information

Books

1. THE UNCLEAR SKY by Louis J. Battan; Doubleday Anchor, N.Y., \$1.45. A meteorologist looks at air pollution.
2. THIS VITAL AIR, THIS VITAL WATER by Thomas G. Aylesworth; Rand McNally, Chicago, 1968, \$4.95. An introduction to air pollution.
3. AIR POLLUTION by Charles W. Lavaroni and Patrick A. O'Donnell; Addison-Wesley, 1971, \$1.68. For students (grades 7-9); with experiments.

4. YOUR ENVIRONMENT AND WHAT YOU CAN DO ABOUT IT by Richard Saltonstall, Jr.; Walker, N.Y., 1970, \$6.95. Contains a primer on air pollution and what you can do about it.
5. CLEANING OUR ENVIRONMENT: The Chemical Basis for Action; American Chemical Society, Washington, D.C. Good factual material on air pollution.
6. THE POLITICS OF POLLUTION by J.C. Davie, Pegasus, 1970, \$6. Good review of the legislative process to achieve air pollution laws.

Publications

1. AIR POLLUTION, 1970, a workbook prepared by Scientists' Institute for Public Information, 30 East 68th St., New York, N.Y., 75¢.
2. THE PROPOSED NATIONAL PRIMARY AND SECONDARY AIR QUALITY STANDARDS: AN ANALYSIS by Scientists' Institute for Public Information, 30 East 68th St., New York, N.Y., 75¢.
3. ENVIRONMENTAL QUALITY, the annual report published each August by the Council on Environmental Quality includes authoritative statements on air pollution. First two published in 1970, 1971. U.S. Government Printing Office, Washington, D.C. 20402. \$2.
4. INADVERTENT MODIFICATION OF WEATHER AND CLIMATE BY ATMOSPHERIC POLLUTANTS by E.W. Barrett, et al. ESSA Technical Report ERL 185-APCL 15. \$1. U.S. Government Printing Office, Washington, D.C. 20402.
5. HELP. Help, Department of Environmental Conservation, 50 Wolf Rd., Albany, N.Y. 12201.

Articles

1. "The Ambient Air" by Edith Iglauer, THE NEW YORKER, April 13, 1968. "Must" reading on air pollution.
2. "The Atmosphere: A Clouded Horizon" by Eugene Peterson, ENVIRONMENT, April 1970. On whether CO₂ increase will balance dust and other pollution.

3. "U.S. Agency Bars Delay on Cutting Auto Pollutants" by E.W. Kenworthy, THE NEW YORK TIMES, May 13, 1972. Contains a good summary of the Clean Air Law.
4. "Far-Reaching Bill Pending in Congress Would Launch Major New Attacks on Air Pollution," CF LETTER, October 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036. A backgrounder on the 1970 Clean Air act.
5. "Air Quality Rules for 6 Pollutants Given for Nation" by E.W. Kenworthy, THE NEW YORK TIMES, April 30, 1971.
6. "Hello, Energy; Goodbye, Big Sky" by John Neary, LIFE Magazine, April 16, 1971. About the new coal power plants in the Southwest.
7. "Why the U.S. Is in an Energy Crisis" by Lawrence Mayer, FORTUNE, November 1970.
8. "Can We Have All the Electricity We Want and a Decent Environment Too?" CF LETTER, March 1970. The Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C. 20036.
9. "Out of the Fog," TIME Magazine, December 12, 1969. On how London has cleaned up its air.
10. "Rise in Rainwater Acidity in the Northeast Tied to Air Pollution" by David Bird, THE NEW YORK TIMES, January 30, 1972. About another "side" effect.
11. "The Cloud Comes to Quibbletown" by Donald Jackson, LIFE Magazine, December 10, 1971. About an air pollution incident in New Jersey in September 1971.
12. "Asbestos" by I.J. Selikoff, ENVIRONMENT, March 1969. All about asbestos dust.

Films*

1. OUR POISONED WORLD -- AIR, 30 min., Time-Life Films, \$350, rental \$30, grades 4-adult. A good overview.
2. AIR POLLUTION, 10 min., Sterling Educational Films, \$135, grades 7-12. A general introductory film to causes and effects of air pollution.

*Addresses of film distributors are given at the end of this guide.

3. THE POISONED AIR, 50 min., purchase Carousel, rental University of Minnesota, University of California, Pennsylvania State University, University of Arizona, Roa's Films. A CBS News production balancing the soothing views of the auto and petroleum industries with those of Senator Edmund Muskie, John Gardner, and a former Los Angeles smog control director.
4. AIR POLLUTION: TAKE A DEEP DEADLY BREATH, 54 min., color, University of Arizona, Kent State University, Contemporary Films/McGraw-Hill, rental \$35. An ABC documentary on the subject.
5. PROBLEMS OF CONSERVATION: AIR, 15 min., Encyclopedia Britannica Educational Corporation, color \$167.50, b&w \$86. Explains difference between natural and manmade pollution, what is being done to help solve the problem through technological and legislative controls.
6. AIR POLLUTION, 15 min., color, Encyclopedia Britannica Educational Corporation, \$167.50 b&w. Explains difference between natural and manmade pollution, what is being done to help solve the problem through technological and legislative controls.
7. THE FIRST MILE UP, 28 min., b&w, Contemporary Films/McGraw-Hill, \$200, rental \$14. Facts and statistics, produced by the National Film Board of Canada.
8. AUTOS, AUTOS EVERYWHERE, 26 min., color, University of Southern California, Indiana University, Kent State University, Contemporary Films/McGraw-Hill. A prediction of what will be done to cars to reduce pollution and other hazards. A CBS production for the 21st Century.

Organizations

1. Air Pollution Control Office
Environmental Protection Agency
1626 K St.
Washington, D.C. 20460
2. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
3. Environmental Protection Administration
Municipal Bldg.
New York, N.Y. 10007

4. Environmental Health Division
World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland
5. Natural Resources Defense Council
36 West 44th St.
New York, N.Y. 10036
6. Scientists' Institute for Public Information
30 East 68th St.
New York, N.Y. 10021
7. Citizens for Clean Air
502 Park Ave.
New York, N.Y. 10022

**ONLY
ONE EARTH**



ONLY ONE EARTH
(THE STOCKHOLM CONFERENCE)

Perspective

Like the meeting of nobles in 1215 that led to the Magna Carta and formation of British parliament or that of the Americans at Philadelphia in 1787 that led to the United States Constitution, the conference at Stockholm in June 1972, could signify a profound change in the course of human events. The United Nations Conference on the Human Environment was at once a recognition that humans had gained a new awareness of their relationship to the environment and a point of departure for new programs of action based on that awareness. It was a world focal point of a modern revolution in human thought and, consequently, human behavior.

This revolution, due in no small part to today's communications, took place like a wild fire. It was just one decade earlier that Rachel Carson in Silent Spring sounded the first popular warning against environmental contamination. Even in 1968 when Sweden first suggested a world conference on the environment, pollution and other environmental stories were not the meat of news editors. The first Earth day preceded the conference by barely 2 years. The lack of environmental information was massive; in fact, the first global inventories were collected to get ready for the conference.

The conference has achieved other kinds of understanding and suggested other potentialities. For example, undeveloped countries initially were apathetic, even hostile to the idea of such a conference where environmental standards and concerns might take precedence over economic development. At first, it appeared to be another ploy on the part of "haves" to preserve their advantage over poorer peoples. However, after patient groundwork, particularly by Conference Secretary-General Maurice Strong, both sides came to recognize a mutuality of interests. Developed nations accepted the aspirations of less developed neighbors to develop resources, as quickly as possible, in order to improve the status of their peoples. At the same time, undeveloped nations began to understand that economic improvement may not have to be accompanied by environmental degradation if new methods and managements are considered. The environmental mistakes of the industrialized countries could serve as valuable lessons of what not to do.

Beyond that, everyone began to take to heart the concept that it really is one world, that nations and peoples are interdependent, that no matter who pollutes the oceans or the air -- everyone suffers.

Moreover, the environmental issue was one which could be approached universally with positive attitudes. After all, the earth, the biosphere are home for everyone. This made environmental problems quite different from all the other problems tackled by the United Nations. As Maurice Strong put it, "Other issues -- nuclear disarmament and warfare; aid and assistance from one country to another and so on -- these are the time-consumers. On environment, you start with a common interest, from both the socialist block of the East and the industrialized countries of the West." Furthermore, environment is "the most international of all the great issues facing the world today. It's not a conference on one specialized area. It's on the whole environment, so it allows us to do something that we haven't done before -- deal with a whole series of interacting relationships. Almost every sector of human activity will be affected."

Strong, a Canadian industrialist before he took over the U.N. post, feels that if the United Nations deals effectively with the environmental question, it will revitalize the world organization. Here would be an example where nations could work together effectively, cooperate, and we would have a positive image to replace so many instances of impasse, frustration, and obstruction.

In this context, Mr. Strong's words take on a larger meaning: "The overriding thing we have to do is convince all the countries that the United Nations framework offers the only available, usable instrument we have for reconciling our differences."

The Broadcast: ONLY ONE EARTH (THE STOCKHOLM CONFERENCE)

From June 5 to June 16, 1972, more than 1,000 high level political representatives from 114 member countries¹ of the United Nations met at Stockholm, Sweden, at a truly historic conference. It was the first time that men and women gathered to organize and certify a global program for human interactions with the environment. This was the United Nations Conference on the Human Environment.

There were colorful touches of pageantry as the participants attended a Swedish welcoming ceremony at the Stockholm Opera House. This was followed by the official inauguration in

¹The Soviet Union and other Communist bloc nations boycotted the conference, in a political gesture, because Communist East Germany was not permitted representation.

the Folkets Hus, the site for the plenary sessions of the conference. The three conference committees met in the New Parliament Building and the Old Parliament Building in downtown Stockholm.

The work of the conference had been prepared for carefully and intensively. To give some idea of the scope of the preparation:

Sweden originally proposed, in 1968, that the United Nations convene a conference on the problems of the human environment. On December 3, 1968, the General Assembly decided unanimously that a Conference on the Human Environment should be held, and the following year Sweden invited the United Nations to meet in Stockholm. This invitation was accepted in December 1969. At the same time, a 27-nation Preparatory Committee was established and work began on the conference.

All told, 115 governments actively participated in the preparation. Seventy-seven of them presented national reports, most constituting their first surveys of their own environmental concern. Most of these countries also set up some form of governmental machinery to deal with environmental problems, so that tangible results were achieved even in advance of the conference itself.

Twelve thousand pages of material -- environmental reports and recommendations for action from governments, agencies, study groups, scientists, observers -- are contained in 350 basic documents submitted to the conference secretariat. This information was distilled into some 600 pages for delegates to study, but the full reports -- what amounts to the first global survey of environmental issues and concerns -- were available in a special Conference Library in Stockholm. Following the conference, the material will be made available as a reference source.

Among the major achievements of the conference were these:

The espousal of a 26-point Declaration on the Human Environment, which says in part that "man has the fundamental right to adequate conditions of life, in an environment of a quality which permits a life of dignity and well-being, and bears a solemn responsibility to protect and improve the environment for present and future generations." Also, the natural resources of earth, including the air, water, land, flora and fauna, and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management as appropriate. It goes on to detail specific areas such as preservation of renewable and nonrenewable resources, the control of discharge of toxic materials into the environment, the responsibility of national

policies to improve environmental conditions, and the responsibility of governments for any environmental degradation their activities may cause beyond their own boundaries. The Declaration also states: "Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons."

While the Declaration is not binding upon member states, it is expected to carry great moral weight and is regarded as a sort of constitution against which future environmental actions could be measured by world opinion.

Approval of an "action program" involving some 200 recommendations in fields that range from monitoring climate change or oceanic pollution to promoting birth control and the preservation of the world's vanishing diversity of plant and animal species. This action is divided into three parts. First and most immediately important is Earthwatch, a global environmental assessment program consisting of evaluation and review, research, monitoring, and information exchange. In order to carry out the monitoring, it is proposed to establish a network of 10 baseline stations to study long-term global trends, along with 100 stations to monitor air pollution on a regional basis. In addition, regional and global networks of research centers and biological reserves would be developed to analyze the structure and functioning of the world's ecosystems. Earthwatch would amass an unprecedented amount of environmental information.

The second part of the action plan would concentrate on how best to use that information in environmental management activities. These would include measures for international cooperation, the management of human activities that have impact upon the environment and management of environmental resources, the setting of goals, and the adoption of legal and economic measures to achieve the goals.

Part three would consist of public information, education, training, and financing measures to support the action plan.

The Stockholm Conference also acted upon six areas of especial concern. Two subjects were assigned to each of three conference committees. The first area of concern was entitled "Planning and management of human settlements for environmental quality." The present environmental crisis faced by human settlement is posed by the twin challenge of urban growth and population distribution. The goal is to create future cities that are efficient and functional, which foster the well-being of man, and which do not disrupt the ecological balance of the

environment. Aspects of the settlements crisis requiring urgent attention include the problems of sanitary water supply, better and more housing, more intelligent land-use policies. Most of this work must be carried out by national governments.

Section two, "Environmental aspects of natural resources management," concentrates on the balance between available natural resources and competing human demands upon them. Resources must be considered in a broad context, and can no longer be considered strictly from single-use or single benefit viewpoints. So natural resources must be managed in an integrated manner with environmental and social amenities taken into consideration. The ideal is always wise exploitation, plus optimum social amenity. While most proposals were fashioned for national implementation, some called for international action or cooperation. One is aimed at stopping the depletion of genetic stocks -- specifically, to avert the disappearance of presently endangered species of plants and animals. The conference called for a 10-year moratorium on commercial whaling.

Section three, "Identification and control of pollutants of broad international significance," deals with worldwide problems of pollution. Prime areas of concern include prevention of food contamination, preservation of air and water quality, global assessment of climate changes, study of the effects of pollutants on terrestrial ecosystems, and a comprehensive approach to preserve the quality of the oceans. Earthwatch, management programs, and information and educational programs -- all mentioned previously in the action plan -- figure in this section.

Section four deals with "Educational, informational, social and cultural aspects of environmental issues." Actions taken in the social and cultural areas are as complex as the environment itself and therefore should be considered in an interdisciplinary basis. UNESCO should take the lead here, certainly as far as educational action is concerned. Public information must parallel the educational campaign in order to enlighten and motivate the public to give broad support to environmental reforms and management. Additionally, the biological and cultural heritage must be rationally managed through preserving certain monument areas, protecting certain islands for science, and so forth.

Section five concerns "Development and environment" and is of particular interest to developing nations. The environmental problems of the developing world are often different from those of heavily industrialized nations inasmuch as they reflect a lack of economic development. The role of the United Nations would be to help these nations to develop, while at the same time avoiding the mistakes and distortions committed in the industrialized countries. Another role would be to anticipate areas of

conflict and reduce tensions between developing and industrialized nations in the coming environmental campaigns.

Finally, the conference dealt with what could be the most important long-range result of the meeting at Stockholm -- the establishment of an ongoing organization within the United Nations to coordinate its environmental programs. This is the permanent successor to the conference and contains the administrative machinery to carry out its functions. Also the conference approved an Environment Fund to cover that part of the international effort not paid for by specialized agencies and national governments. Pledges indicate that the fund will reach at least \$100 million, which has been considered the minimum requirement for the first 5 years of operation.

In his concluding speech, conference secretary-general Maurice Strong said, "The fundamental task of the Stockholm conference has been to take the political decisions that will enable the community of nations to act together in a manner consistent with the earth's physical interdependence. This was our mandate. This is what we did."

What can I do?

Perhaps the most important thing you can do is to reexamine your overall attitudes toward environment and toward the United Nations in the light of this new campaign on the human environment. An entirely new initiative is now being taken by the world organization in response to an entirely different kind of global crisis. And international cooperation is a prerequisite for any effective action on the global scale.

Despite some ruffled political feelings and an uncomfortable reminder of oldtime political infighting and intransigence (over participation of Communist East Germany), the conference was refreshingly free of the past failures and partisan forms of noncooperation that have plagued U.N. operations. This time, on this issue, the tenor is one of cooperation. The attitude is one of "can do."

The United Nations and the Conference on the Human Environment need support, moral and financial. The individual can supply the former. If enough people do, their governments will be more disposed to supply the latter.

This conference has demonstrated technically, scientifically, practically that human interdependence is more important than human differences. Each person's confidence in the first, rather than suspicions over the second, can contribute to environmental protection.

For further information

Books

1. ONLY ONE EARTH: The Care and Maintenance of a Small Planet by Barbara Ward and René Dubos; W.W. Norton, hardcover; Ballantine, soft cover; N.Y., 1972. This contains the contributions of 152 distinguished individuals in 58 countries who served as consultants for what is a world report on the human environment, and the general readers' background text for the Stockholm Conference.
2. MAN IN THE LIVING ENVIRONMENT; The National Institute of Ecology; University of Wisconsin Press, Madison, Wisc., 1971. A collective analysis of the important world problems concerned with environmental quality and management by a group of ecologists.
3. IN DEFENSE OF EARTH by Lynton K. Caldwell; Indiana University Press, Bloomington, Ind., 1972, \$8.50. A study of environmental policy and administration.
4. EVERYMAN'S UNITED NATIONS; United Nations, N.Y.; U.N. Publication E. 67.15, \$2.50. All about the U.N.
5. Write to:
United Nations Association of the U.S.A.
833 United Nations Plaza
New York, N.Y. 10017
for publications list on United Nations.
6. UNA-USA World Affairs Book Center
345 East 46th St.
New York, N.Y. 10017

Publications

1. MAN'S HOME is a series of five booklets prepared with the cooperation of the Secretariat of the United Nations Conference on the Human Environment to provide a general understanding of major environmental issues discussed at the Stockholm Conference. United Nations, N.Y. 10017, \$1.
2. PROBLEMS OF THE HUMAN ENVIRONMENT, report of the Secretary-General (U Thant) to the General Assembly through the Economic and Social Council, May 26, 1969. The Secretary-General's official, comprehensive statement on the subject.

3. THE UNITED NATIONS AND THIS BELEAGUERED EARTH, a discussion guide containing references to sources material. May be ordered from:
American Association of University Women
2401 Virginia Ave., NW
Washington, D.C. 20037
or
United Nations Association of the U.S.A.
833 United Nations Plaza
New York, N.Y. 10017
(single copy -- 30¢, 100/\$20, 1,000/\$150)
4. THE HUMAN ENVIRONMENT: NEW CHALLENGE FOR THE U.N., an overview of current U.N. programs in the environmental field. United Nations Publication No. OPI/433, United Nations, N.Y. 10017, February 1971, 20¢.
5. ENVIRONMENT, a collection of articles and program suggestions on international aspects of the environmental crisis. United Nations Association of the U.S.A. (see Organizations), 1971, \$2.50.
6. U.S. NATIONAL REPORT ON THE HUMAN ENVIRONMENT, official U.S. report to the United Nations outlining national environmental problems and topics for the Stockholm Conference. Department of State Publication 8588, June 1971. U.S. Government Printing Office, Washington, D.C. 20402. 40¢.
7. THE UNITED NATIONS: ISSUES IN UNITED STATES FOREIGN POLICY, an overview of all aspects of U.N. work with stress on issues of concern to the United States. U.S. Government Printing Office, No. 5, U.S. Department of State, 1970, \$1.
8. THE UNITED NATIONS DEVELOPMENT PROGRAMME -- WHAT IT IS; WHAT IT DOES; HOW IT WORKS; WHY YOU SHOULD CARE, 1970, free, UNDP (see Organizations).
9. REPORT OF THE PRESIDENT'S COMMISSION FOR THE OBSERVANCE OF THE 25th ANNIVERSARY OF THE UNITED NATIONS, recommendations for strengthening the U.N. and U.S. participation in it. U.S. Government Printing Office, Washington, D.C. 20402, 1971, 60¢.
10. THE UNITED NATIONS IN THE 1970'S, proposals for making the U.N. more effective. United Nations Association of the U.S.A., 1971, \$1.
11. VISTA, a bimonthly magazine on U.N. activities published by the United Nations Association of the U.S.A. \$4 a year, \$1 a copy.

12. COURIER, a magazine frequently dealing with environmental matters, published by UNESCO. Write to UNIPUB, P.O. Box 433, New York, N.Y. 10016.

Articles

1. Write to:
United Nations Conference on the Human Environment
United Nations, N.Y. 10017
for reports on the Stockholm Conference
or
Consult Readers' Guide to Periodical Literature
2. "The U.N.'s Role in the Preservation of the Environment" by Barbara Ward, VANTAGE, U.S. Catholic Conference, Division of U.N. Affairs, 323 East 47th St., New York, N.Y., 10017, 25c.
3. "Three Reports on Global Pollution and the United Nations," SATURDAY REVIEW, Aug. 7, 1971.
4. "The Ecology Backlash" by Stanley Johnson, VISTA (see Publications), Sept.-Oct. 1970.
5. "A Message to our 3½ Billion Neighbors on Planet Earth: SOS Environment," UNESCO COURIER (see Publications), July 1971. 50c. Describes programs to fight pollution on three continents.
6. CF LETTER -- November 1971 and April 1971. Both issues are devoted to the Stockholm Conference with thorough discussions on the need for an effective international institution on the environment. Conservation Foundation, 1717 Massachusetts Ave., NW, Washington, D.C. 20036.

Films*

1. ENVIRONMENT, 29 min., BFA Educational Media, \$370, rental \$25, grades 7-adult. About the degradation of our living environment and what can be done to bring about harmony with nature.

*Addresses of film distributors are given at the end of this guide.

2. THE RACE IS LOSING, 30 min., Time-Life Films, \$350, rental \$30, grades 7-adult. Man is accelerating the deterioration of the environment with each passing year. Presents a consideration of alternative choices for doing something about it.
3. MAN'S EFFECT ON THE ENVIRONMENT, 14 min., BFA Educational Media, \$175, rental \$10, grades 7-12. Shows how man has altered the environment through exploitation.
4. WATER, 15 min., animated, New York University, University of California, Indiana University, Pennsylvania State University. The international crisis for lack of water. The film points out that national boundaries make the problem more complicated.
5. WHAT ARE WE DOING TO OUR WORLD?, Part I, 27 min., color, Contemporary Films/McGraw-Hill, \$350, rental \$18. Focuses on Lake Erie, atmosphere, nuclear power. Part II, 25 min., color, \$350, rental \$18. Focuses on ecosystem under study in New Hampshire, the Everglades, and effects of proposed new sea-level canal.

Slide Films

1. THIS IS YOUR EARTH produced by UNESCO, 1971, 50 slides, written commentary and record, runs approximately 30 minutes. A general introduction to threats posed by man to the biosphere. \$15 from UNIPUB, P.O. Box 433, New York, N.Y. 10016.

Organizations

1. United Nations Conference on the Human Environment
United Nations, N.Y. 10017
2. Office of Public Information
United Nations, N.Y. 10017
For other information about the United Nations.
3. UNESCO
UNESCO House
Place de Fontenoy
Paris 7e, France
4. World Health Organization
20 Avenue Appia
1211 Geneva, Switzerland

5. United Nations Development Programme
833 United Nations Plaza
New York, N.Y. 10017
For information about world development and environment.
6. United Nations Association of the U.S.A.
833 United Nations Plaza
New York, N.Y. 10017
For publications and film lists, other information.
7. U.S. Mission to the United Nations
799 United Nations Plaza
New York, N.Y. 10017
For statements of U.S. policy and other U.S.-U.N.
information.
8. UNA-USA World Affairs Book Center
345 East 46th St.
New York, N.Y. 10017
Books, publications also may be ordered from U.N. Sales
Section, United Nations, N.Y. 10017.

**UNDER
NEW
MANAGEMENT**



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UNDER NEW MANAGEMENT

Perspective

The environmental crisis came to human attention piecemeal. Scientists discovered that with atomic bomb testing there was such an unintended "side" effect as radioactive fallout. Air pollution, perceived as a quite separate phenomenon, insinuated itself into people's eyes and lungs. Not uniformly, though, but in isolated pockets. Over New York City. Over Los Angeles, Chicago, Washington. Of course, people read of the killer smogs of London and Donora and the erosion of historic edifices in Athens, but only commercial airline pilots saw that the same coffee haze shrouded the Los Angeles region and Denver and St. Louis and the Chicago-Detroit-Cleveland axis and a broad corridor along the East Coast from Boston to Washington.

Some of these pilots also observed the brown stain in the Atlantic Ocean outside New York harbor where the city dumped its sewage sludge. People who lived and worked on the ground along the Hudson River knew how polluted that waterway was, but it took time to learn that a similar situation existed along the lower Delaware, the Mississippi, the Rhine and Seine, in the Baltic Sea and the Mediterranean, off Madagascar.

With awareness, the blights seemed to become ubiquitous. Chemical poisons. Noise. Thermal. Stench. Overloaded garbage dumps and auto graveyards, junk and litter everywhere. Denuded forests. Visual. Land abuse from strip mining and irresponsible development. Urban sprawl and urban rot and congestion and a train of social ills.

Finally, these environmental ailments coalesced into a continuous spectrum. Finally, they were conceived as symptoms of one central process: human beings were overtaxing the environment, overwhelming its capacity to maintain equilibrium. The interchangeability became evident: dump garbage into the nearest stream, you have water pollution; throw it on land, land pollution; incinerate, it becomes air pollution.

Water pollution, waste disposal, forest destruction, and land erosion are old problems with man, but most of these symptoms certainly in their aggravated states, appeared almost simultaneously along with the tremendous technological escalations following World War II. Virtually no one had taken environmental impact into account. Behold, there was an environmental crisis!

Men reacted to these diverse dislocations with attempts to correct the observed faults, on a one to one basis. This is the way humans always have dealt with things, cause and effect -- change the cause and you change the effect. But environmental

problems proved to be not so simple. No matter what remedies Holland undertook the Rhine would continue to flow a filthy river unless Germany took action. Automobiles and the generation of electric power cause most of the air pollution. People want autos and always more power. Should autos be banned from central cities? Should we return to mass transit? Can auto pollution devices answer the problem? If fewer cars are manufactured, who will answer for the loss in jobs, the effect on the economy? Will people be willing to change their life styles? Will they be forced to do so? The questions proliferate. And they illustrate the highly complex, interlocking relationships involving human activities and environmental responses.

This has led to the understanding that just as the symptoms of environmental trouble are not piecemeal, neither can durable solutions be achieved in isolation. What is called for is environmental management, a term that began to gain currency in connection with the United Nations Conference on the Human Environment. Quite possibly no one has yet fully assessed what an enormous project environmental management is...particularly when one stops to consider that environment encompasses everything that affects us: land, sea, air, water, minerals, our own species and all other life, our human culture, our individual thoughts and attitudes and behavior, and the interactions of all these constituents.

One scientist working in the field defined an environmental manager as a person who is trained to examine all the options to see that the greatest number of people get maximum benefits from the available resources. Another way of looking at it might be to say it is an effort to integrate humans with their world.

The Broadcast: UNDER NEW MANAGEMENT

The broadcast opens on the great Brazilian rain forest, the biggest unexplored land mass on earth, habitat for teeming species of plants and wildlife and some 80,000 surviving Indian natives. It is one of the world's important suppliers of oxygen, and it is regarded by Brazil as a land reservoir for its people... as a coveted area for agricultural, urban, and industrial development...as the key to new prosperity.

There cannot be great farms, ranches, cities, industrial plants while the forest remains; but if the forest is cut, the most naturally productive region on earth will be gone. If the land is denuded, so will a great oxygen factory.

The opening scenes focus on the new Trans-Amazon Highway under construction. It is a spearhead into the rain forest. It will become a spine from which the ribs of civilizations will

grow. The highway is a forerunner of what is to come. Brazilians want to do no more than Americans have done to the United States -- to provide adequate land for their people to occupy, to develop and become industrialized and prosperous. While there are fears that the tropical soil will not support agriculture for very long, Brazilians do not abide by what they consider an unduly pessimistic appraisal. With proper fertilizers, they maintain, the soils can be kept arable, particularly with perennial crops like coffee.

Tropical ecologist William Denevan believes that the entire Brazilian rain forest will disappear by the end of this century with difficult-to-calculate effects upon climate, land, and economy. If present slash and burn tactics followed by poor agricultural techniques continue, Denevan believes that the land will be useful only for grazing. Raising beef does not employ many people. If Brazil curbed her population explosion, Denevan says, it would not need the forest area and could avoid catastrophe.

No one knows for sure what would happen to the oxygen supply with the forest gone. If it is replaced with grasslands and other vegetation, perhaps the loss would be slight. If the area becomes a desert, the loss might be significant.

Here, then, is a modern dilemma. Is Brazil taking the route to prosperity or to catastrophe? Is the key to success, development and growth or equilibrium, which is an end to growth if not development? This issue has gained widespread attention through the publicized book, The Limits to Growth. The book presents computer studies showing that if population and industrial growth are not brought to an end, we will plunge into a global disaster. U.N. economist and Under Secretary-General Philippe de Seynes commends the study as a beginning, but believes that the real-life global situation is too complicated for such a forecast to be reliable. De Seynes believes that growth is essential for improving the lot of mankind.

What is needed is development with environmental protection -- a new discipline, a new science, environmental management!

We may appreciate what a challenge this is by reminding ourselves what environment is. A film montage suggests how comprehensive our environment is. Starting with conventional scenes of sun, sky, mountains, trees, waterways, we then see it as the habitat of wildlife and man. Rhythm and music affect and alter our environment; so do our activities, the pollution from our industries and transportation; and our culture, what we learn and what we think -- how we regard the enveloping reality around us.

Environment is so important, psychologist B.F. Skinner tells us, that really the only way we can change human behavior is through changing the human environment. So environmental management may become the crucial human enterprise as we move toward the increasingly dangerous, populated, and polluted world of the future.

A significant attempt is being made at the University of Wisconsin, at Madison, to develop the art and science of environmental management and to train environmental managers.

Before one can manage effectively, one must know exactly what is happening. Therefore, so much stress is placed on environmental monitoring. With advanced techniques in remote sensing -- through satellite photography, aerial color and infrared photography and thermal imagery -- environmental scientists can know with a high degree of accuracy what is taking place on the land and waters. Such surveillance can detect trees that have died from Dutch elm disease and map thermal discharges from paper mills, measuring the water to one-tenth of a degree.

In the Biotron, a laboratory unique in the world, micro-environments can be controlled precisely in 48 separate rooms so that scientists can study a variety of life-environment relationships under exact conditions. The exhaustive study of the behavior of the desert iguana lays the basis for learning about human behavior in a much more complex ecosystem.

A study, undertaken at the request of civic authorities, is assessing the reasons for eutrophication of Madison's Lake Wingra. This multilevel, multidiscipline investigation includes studies of aquatic life in the lake and the impact of man upon the body of water.

Finally, mineralogist D. Vincent Manson reminds us that the environment had been here for billions of years before man arrived and will remain for eons no matter what man does. The problem, really, is not one of environmental management, but of human management.

What can I do?

If environmental management means to integrate humans with their world, then it follows that the individual can take actions that will adapt himself more closely to natural ecological patterns. He can lighten his load upon the environment -- recycling, minimizing use of electrical and other power instruments, reducing dependence upon synthetic chemicals...in other words, applying the recommendations contained in the preceding sections of this guide.

That, and learning more about a subject so new that it has not yet been completely formulated or defined -- a subject that is fascinating, that almost certainly will have great bearing on man's future activities, that is a gateway to future thinking.

For anyone contemplating a future career, the subject of environmental management offers unplumbed opportunities. The institutions of the State University of New York at Stony Brook and at Albany offer a variety of environmental courses. The Scientists' Institute for Public Information (30 East 68th St., New York, N.Y. 10021) published in 1970 a survey of universities offering environmental ecological studies; but the list grows, so that it would be worthwhile to inquire at the college of your choice.

For further information

Books

1. MAN IN THE LIVING ENVIRONMENT: The National Institute of Ecology, University of Wisconsin Press, Madison, 1971. Ecologists' view of problems related to environmental quality and management.
2. FUTURE ENVIRONMENTS OF NORTH AMERICA edited by F. Fraser Darling and John P. Milton; Natural History Press, Garden City, N.Y., 1966, \$5.95. A basic text on the subject, loaded with information.
3. ENVIRONMENTS OF MAN edited by Jack B. Bresler; Addison-Wesley, Reading, Mass., 1968.
4. THE LIMITS TO GROWTH by Dennis Meadows, et al.; Universe Books, N.Y., 1972, \$2.75.
5. WORLD DYNAMICS by Jay W. Forrester; Wright-Allen Press, Cambridge, Mass., 1971, \$9.75. This supplies the statistical studies on which THE LIMITS TO GROWTH is based.
6. BEYOND FREEDOM AND DIGNITY by B.F. Skinner; Knopf, N.Y., 1971, \$6.95. The crucial importance of environment to human beings.
7. FUNDAMENTALS OF ECOLOGY by Eugene Odum; W.B. Saunders, Philadelphia, \$11.75. For an understanding of ecology.
8. DESIGN WITH NATURE by Ian McHarg; Doubleday, Garden City, N.Y., 1969, \$5.95. Ecological land use and landscaping.

9. EARTHKEEPING by Gordon Harrison; Houghton Mifflin, Boston, 1971, \$5.95. Accent on the individual's contribution.
10. POPULATION, RESOURCES, ENVIRONMENT by Paul R. Ehrlich and Anne H. Ehrlich; W.H. Freeman, San Francisco, 1970, \$8.95.
11. MANAGING THE ENVIRONMENT: International Economic Cooperation for Pollution Control, edited by Allen Kneese, Sidney Rolfe, Joseph Harned; Praeger, N.Y., 1971, \$15. Findings of a conference on "Goals and Strategy for Environmental Quality Improvement in the 1970's."
12. THE ECOSYSTEM CONCEPT IN NATURAL RESOURCE MANAGEMENT, edited by George M. Van Dyne; Academic Press, N.Y., 1969, \$16.50. Highly technical and leaving man out of the picture.
13. TECHNOLOGY AND GROWTH by E.J. Mishan; Praeger, N.Y., 1970, \$7.95. Views of an unorthodox economist who sees the penalties of growth.
14. OUR PLUNDERED PLANET by Fairfield Osborn; Little, Brown, Boston, 1948. A record of the environmental toll exacted by man.
15. THE QUIET CRISIS by Stewart Udall; Avon, N.Y., 1963, 95¢. A review of the conservation movement and opposing forces.
16. THE PACIFIC SALMON FISHERIES: A Study of Irrational Conservation by James Crutchfield and Giulio Pontecorvo. Published for Resources for the Future by the John Hopkins Press, Baltimore, 1969, \$6. Economists on resource management.
17. THE LAST LANDSCAPE by William H. Whyte; Doubleday, Garden City, N.Y., 1968, \$6.95.
18. THE AFFLUENT SOCIETY by John Kenneth Galbraith; Mentor, N.Y., 95¢. On continuous growth as an ideal.
19. THE LIFE OF THE JUNGLE by Paul W. Richards; McGraw-Hill, N.Y., 1970, \$4.95. Ecology of rain forests with a discussion of "slash and burn" agriculture.
20. THE LIFE OF THE AFRICAN PLAINS by Lester Brown; McGraw-Hill, N.Y., 1972, \$4.95. Primitive human and natural environments.

Articles

1. "Ecolibrium" by Athelstan Spilhaus, SCIENCE, 175, February 18, 1972. On the need for long-term planning.

2. "The Strategy of Ecosystem Development" by Eugene P. Odum, *SCIENCE*, 164, April 18, 1969. An understanding of ecological succession, the author says, provides a basis for resolving man's conflict with nature.
3. "The Human Environment in Technological Societies" by René Dubos, *THE ROCKEFELLER UNIVERSITY REVIEW*, July-August 1968.
4. "Resources, Population, and Quality of Life" by Preston Cloud, meeting of the American Society for the Advancement of Science, Boston, December 29, 1969.
5. "Needed: Effective Management of Our Priceless Shorelines and Estuaries," *CF LETTER*, May 1970. Conservation Foundation, 1717 Massachusetts Ave., Washington, D.C.
6. "Environmental Quality: When Does Growth Become Too Expensive?" by S. Fred Singer. Paper presented to American Association for the Advancement of Science Meeting, Boston, December 1969. It becomes too expensive, the author says, when the cost of maintaining environmental quality becomes unacceptable to society.

Films*

1. A SEARCH FOR ECOLOGICAL BALANCE, 38 min., Film Images, \$360, rental \$25, grades 7-adult. Ecologist Eugene Odum, with a call for a sound master plan for the total environment.
2. MULTIPLY AND SUBDUE THE EARTH, 67 min., Indiana University, color, \$450, rental \$18.50, b&w \$270, rental \$13.50, grades 10-college. Ian McHarg points out that man needs to know how much he can intervene and still remain in harmony with the land, must know land's carrying capacity when undertaking development.
3. POLLUTION IS A MATTER OF CHOICE, 54 min., NBC, Pyramid, University of Michigan. An NBC News special presented April 7, 1970, it focuses on the predicament of wanting what technology creates, yet being destroyed by its wastes.
4. THE TRAGEDY OF THE COMMONS, 23 min., King Screen Productions, \$295, rental \$35, grades 7-adult. The story of what happens when a common resource is overused.

*Addresses of film distributors are given at the end of this guide.

5. THE RACE IS LOSING, 30 min., Time-Life Films, \$350, rental \$30, grades 7-adult. On correct uses of technology and alternative choices for a healthier environment.
6. MEN AT BAY, 26 min., color, King Screen Productions, University of Michigan. A discussion of the threatened destruction of San Francisco Bay, and proposed solutions.
7. ENVIRONMENT, 29 min., BFA Educational Media, \$370, rental \$25, grades 7-adult. Film points out that causes of environmental deterioration are complex and related to advantages of industrialized society, raises question of what balance can be achieved between technology and quality of environment.
8. PROBLEMS OF CONSERVATION: OUR NATURAL RESOURCES, 11 min., Encyclopedia Britannica Educational Corporation, \$135, rental \$8, grades 7-12. An overview of growing crisis in natural resources.
9. PROBLEMS OF CONSERVATION: MINERALS, 16 min., Encyclopedia Britannica Educational Corporation, color \$200, b&w \$102.50. Designed to stimulate student discussion on effects of mineral depletion.
10. GRASSLAND ECOLOGY -- HABITATS AND CHANGE, 13 min., Centron Educational Films, \$175, rental \$17.50, grades 4-12. Emphasizes man's responsibility and stewardship for remaining natural environments.
11. LIFE IN A TROPICAL FOREST, 30 min., Time-Life Films, \$300, rental \$30, grades 4-adult. The story of the forest ecosystem.
12. ECOLOGY -- OLYMPIC RAIN FOREST, 20 min., International Film Bureau, \$250, rental \$12.50, grades 7-adult. Explains ecology of a rain forest.
13. OUR VANISHING WILDERNESS -- THE PRAIRIE KILLERS, 30 min., Indiana University, \$315, rental \$11.50. Shows poisoning of prairie dogs and coyotes and how chain of life becomes a chain of death.

Organizations

1. Conference on the Human Environment
United Nations, N.Y. 10017
2. Man and the Biosphere Program
UNESCO
Place de Fontenoy
Paris 7e, France

3. Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
4. Institute for Environmental Studies
University of Wisconsin
1225 West Dayton St.
Madison, Wis. 53706
5. The Ecological Society of America
Frank McCormick, Secretary
Department of Botany
University of North Carolina
Chapel Hill, N.C. 27514
6. The World Environment and Resources Council, holding its
organizational meeting in The Hague, Netherlands, in
June 1972, is designed to be a clearinghouse for pro-
fessional societies, sorting recommendations on environ-
mental priorities and research.
Contact: Dr. Enrico P. Mercanti
The World Environment and Resources Council
12415 Shelter Lane
Bowie, Md. 20715

THE CITY WITH A FUTURE



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THE CITY WITH A FUTURE

Perspective

After human beings domesticated certain species of plants and animals and thus were able to collect and store food, people began to live together in greater concentrations. Cities were born. Records of the present city of Jericho in the Middle East go back 6,000 years. By that same time, -- 4000 B.C. -- Ubad, the first known Mesopotamian city-state, had arisen. By 3000 B.C., the Sumerian civilization was flourishing in a string of cities in the fertile Tigris-Euphrates plain. The first human story that we know, the EPIC OF GILGAMESH, relates the superheric adventures of a king of a Sumerian city, Uruk.

Cities sprang up as centers for trade and as citadels for military defense. But as they evolved they served many other facets of the human quest. They became centers for learning, for skills and investigation, for laws and government; they became the main repositories of culture. While the mighty Roman Empire disintegrated into the sands of North Africa and marble ruins of Europe, Rome survived with an ever-renewing vitality as capital of Christendom and today as a world cultural-diplomatic-economic-fashion design capital. London once was a Roman outpost, a Saxon capital, a Norman capital, hub of the world's most far-flung empire. Even as the sun sets on that empire, London goes on, seemingly invincible, now vying with Paris for cultural hegemony of the world.

With the Industrial Revolution, cities became centers for the manufacture of products. With the post-Industrial shift to services, cities still demonstrate their viability. But suddenly and without precedence, many cities in industrialized societies -- most particularly in the United States -- seem to have been infected by some plague. We are familiar with the symptoms: inner city decay; the decline of municipal services, prosperity, amenities; the deterioration of environment; and the loss of desirability as a place to live. Coupled with this was the preference of tens of millions of people for suburban living, domiciles in lower-density areas. People apparently wanted the benefits of country life without losing the urban amenities. With the improvement of road systems, advent of heavy motor vans, acceleration in the speed of travel, and improvements in communications, it became physically possible and economically feasible for industrial and management centers to disperse into the countryside. The flight of residents and businesses to the suburbs, with a resulting traffic congestion and diffusion of focus in a geographically larger and more amorphous community, is a consequence.

Extrapolation of this trend has led some persons to foresee the death of cities, an eventuality that seems difficult to accept given the human record to date. But the sign of contemporary times is change, and who can predict that the future will be a projection of the past? Unquestionably, ready accessibility to outlying areas through massive expansion of the auto-highway system has played a key role in the hemorrhaging of cities into the adjacent countryside. Planners laid high-speed expressways to connect a city with a suburb or with another city and got, instead, urban sprawl.

That was perhaps the most disturbing part of the decline of cities. No one quite knew why or how it was happening. All sorts of programs were tried to stanch the flow and repair the damage: model cities, urban renewal, Federal housing, welfare subsidies, job training, highway networks, now, revenue sharing. All were liberally supported and dissected with studies and analyses, inspected by commissions and committees. Yet no one quite seems able to diagnose the city sickness. Everyone hopes that a remedy can be found, because almost everyone's welfare in one way or another is affected by urban success or failure. But, individually, almost everyone who can tries to flee the urban contagion.

Jay W. Forrester, the systems analyst at Massachusetts Institute of Technology whose world computer modeling formed the theoretical basis for the recent advocacy of limiting economic and other forms of growth (see THE LIMITS TO GROWTH), sees the city as a complex system. As such, it is governed by the complicated interactions of a great number of factors exerting both internal and external pressures upon the urban organism. Cities are like magnets, Forrester says, attracting or repelling people. If a city is too attractive or attractive in a great many respects, then people are continually drawn into its environs until the sheer bulk of population finally overwhelms the former attractiveness. One thinks of the post-World War II history of Los Angeles and Southern California.

A solution to this kind of dilemma, Forrester says, is for different cities to be attractive for different reasons or in different ways -- in other words, cities should strive to maintain their original individuality and eschew the trend toward homogeneity. Forrester also advocates curtailment of low-cost housing and its replacement with industrial parks and labor-intensive industries. Urban problems, Forrester says, are symptoms that the system is not working properly. First and foremost, urban doctors must recognize that it is a system with which they are dealing, and not simply a set of problems which they can cure by frontal assault or simple cause-and-effect treatment. The ideal is a self-regulating urban system wherein excesses, dislocations, inequities are righted by the internal pressures of the system itself...not with band aids and crash programs. Whether this lesson will be learned...whether

Forrester is right...remains to be determined. For most of his theories are just that, theories. However, some of them are being applied, particularly in Lowell, Massachusetts, so that their practicality is being tested.

Several other approaches and lines of attack are presented in the broadcast.

The Broadcast: THE CITY WITH A FUTURE

Human history is intertwined with the growth and development of cities, those complex concentrations of people that permit the fullest expression of culture. In its introductory phase, the broadcast scans cities of the world to note their glories and the increasingly disturbing problems they are presenting to contemporary civilization. There is dynamic forward movement, but also the haphazard development that fosters a chaos of congestion. There is continuing growth, but that is leading to overcrowding and critical masses of people. To preserve orderly development, to bring order out of growing disintegration, there is a growing cadre of urban designers, urban ecologists, city planners.

The thematic conflict was laid down by the Secretary-General of the United Nations in his report of August, 1970, Housing, Building and Planning: Problems and Priorities in Human Settlements. Human settlements, the report says, "are the most important part of the human environment.... Humanity now faces two alternatives: to continue the largely exploitive and uncontrolled approach to physical development, leaving fundamental direction to chance and haphazard decision, or to seek comprehensive planning and action for the development of the human environment. The first alternative will be disastrous to our globe. The second will help build a better life for this and all generations to come...in our time it is the utopians who have become the realists."

THE CITY WITH A FUTURE then goes on to examine some solutions that are practicable and to indicate that urban problems are tractable. First stop is Walt Disney World at Lake Buena Vista, Florida. At first blush, this might seem a curious choice for this Walt Disney World already is famous as an amusement-entertainment mecca for tourists: it is not a real city in which people live and work (except for the Disney staff, of course). But upon closer examination, we see that Disney World serves as a fine model for the operation and testing of many technological innovations which are applicable to "real" cities. Moreover, Disney World can handle a daily influx and exodus of some 40,000 people a day, and that statistic means that this settlement must deal with many real problems of transportation, providing food and other services, sanitation, controlling pollution, and maintaining an attractive environment.

These are some of the technological improvements installed in a planned-from-scratch, ecologically balanced tourist community that already has won the attention of urban planners and designers:

The service basement: an underground network of utility tunnels for water, electricity, telephone, sewage, air ducts, and so forth; the underground corridors also are conduits for a fleet of electric vehicles and walkways for park personnel. Staff services such as laundries and cafeterias also are quartered here.

Pneumatic garbage disposal: tubes running through the substructure can carry 50 tons of refuse a day at 60 miles an hour to a central compacting plant.

An integrated transportation network which features a monorail for primary conveyance of tourists. This system is supplemented by electric carts and trains, and boats which navigate a series of canals. All these vehicles are powered by low-polluting or nonpolluting fuels. Visitors' high-polluting automobiles are parked outside the development.

Disney World boasts clean power: an energy system designed to minimize pollution; it uses recycled waste heat to power the cooling system; an incinerator cleans its own smoke, giving off clean steam.

Modular habitations: more than 1,500 prefabricated steel units constitute both a 14-story A-frame hotel and a low-rise "polynesian village."

A computerized and centralized communications system monitors and controls all mechanical devices, utilities, and the fire protection system in the park.

More than one-fourth of the 27,000-acre Disney World -- 7,500 acres -- is devoted to wilderness conservation and remains a wildlife preserve, which along with extensive air and water pollution controls helps to keep the environment clean. An experimental waste-water reclamation project irrigates a 100-acre experimental tree farm.

While Disney World is a simplified laboratory model in comparison to the more difficult political and social pressures and already-existing structures and prerogatives in cities, nevertheless the center is proof that some technological solutions do work and can improve urban living.

Toronto, Canada, serves as a model for what can be and is being done in a real city. Here we see the effectiveness of both

political and social processes in the crucible of urban reality. Several circumstances conspired to give Toronto an advantage in dealing with its typical urban problems, which may be gauged by the fact that Toronto is the fastest growing metropolitan area in North America. Toronto still is a relatively young city and so is not beset by the magnitude of decay which bedevils other cities. It is largely free of the problems associated with racial prejudice and widespread poverty. Its citizenry are impressively sophisticated about the workings of urban ecology and actively inject themselves into it. This crucial citizen role has been expressed in several ways. Urban ecology was the crucial issue of a recent municipal election. David Crombie and a group of "antidevelopment" reformers won the election on a platform of quiet neighborhoods, fewer cars, and controlled development. Earlier, a similarly-minded William Davis was elected premier of the province of Ontario and, with active citizen support, he literally stopped an elevated expressway in mid-lane. Now Davis is going ahead with plans for an advanced urban public transit system (which is examined in TRAFFIC OR TRANSIT). Still another example: when Toronto decided to push an urban renewal scheme that would have obliterated an existing neighborhood, irate crowds confronted the bulldozers and forced a halt to the project. Then the people sat down with the planners to work out something closer to popular desires.

THE CITY WITH A FUTURE looks at several of Toronto's current development projects to show what can be done when government is reflecting the wishes of the people and when people care enough to participate in the future development of their city. Officials and observers still are watching the Toronto experiment, for it is still a possibility that such mass participation in decision making will in the end frustrate all development and insure only the status quo. The Toronto experience illustrates a second major theme of the broadcast, a conclusion reached in a study for a projected extensive investigation of world cities sponsored by the Film Board of Canada and stated in the following words (from URBA - 2000, see Publications):

"Solutions to urban problems are not to be found primarily in large-scale projects, ideas, or revolutionary concepts (technological or otherwise); they consist primarily, in every case, in a search for consensus. Wherever city life is found to be recovering, achieving, or enjoying some degree of equilibrium, it is first and foremost owing to the principle of respect for the public -- all of the public, the population as a whole. It is owing to the authorities' respect for a consensus, for the stated wishes of the urban community, for the will of the majority. Success results when the authorities consult the public at large, working with and for the people.

"This may appear to be self-evident, an example of the most elementary common sense. In the great majority of cities, however, both in Canada and abroad, the exact opposite has happened and is still happening. The power of highly active minorities (promoters, professional groups, certain agencies with restraining powers, all lobbies...) win out over the public interest, the interests of the public as a whole, all the citizens of the city, together rather than by sectors."

What can I do?

The example of Toronto cited in the broadcast presents the central thesis of the MAN BUILDS - MAN DESTROYS series. It can be done through citizen participation, through action by the individual. Even a problem as mammoth as urban decline and confusion is amenable to coherent direction and, in a democratic society, a strong stand by the people affected.

Therefore, know what your local representatives stand for, become conversant with their performance, let them know how you feel about their work, vote for or against them when the time comes. Take part in your neighborhood activities; in the five boroughs of New York City, for instance, there are 1,300 block associations. Attend planning board meetings, find out what is proposed (or not being done) for your area; there are community school board meetings. If there is some project you wish to promote, or block, find out if some ad hoc group has been formed for that express purpose. Join it and act through it: legislators cannot afford to ignore group expressions (see What can I do? section of IT CAN BE DONE).

Many other specific recommendations for ways you can help your city and help improve urban living are given in the What can I do? sections of THE KEEPING OF THE GREEN, THE CAR IN THE CITY, TRAFFIC OR TRANSIT, and THROUGH THE MILL ONCE MORE.

For further information

Books

1. THE CITY IN HISTORY: ITS ORIGINS, ITS TRANSFORMATIONS AND ITS PROSPECTS by Lewis Mumford; Harcourt Brace, N.Y., 1961, \$4.95. The definitive historical study of urban development.
2. THE ECONOMY OF CITIES by Jane Jacobs; Vintage-Random House, N.Y., 1969, \$1.95. An incisive study of the economic forces which shape cities, causing them to prosper or stagnate.

3. THE DEATH AND LIFE OF GREAT AMERICAN CITIES by Jane Jacobs; Random House-Vintage, N.Y., 1961, \$1.95.
4. URBAN DYNAMICS by Jay W. Forrester; M.I.T. Press, Cambridge, Mass., 1969. A systems dynamics approach to the interlocking relationships in urban growth and stagnations.
5. THE URBAN PROSPECT by Lewis Mumford; Harcourt Brace, N.Y., 1968, \$2.45.
6. THE CULTURE OF CITIES by Lewis Mumford; Harcourt Brace, N.Y., 1938, 1970, \$4.95.
7. REDOING AMERICA: A NATIONWIDE REPORT OF HOW WE CAN MAKE OUR CITIES AND SUBURBS LIVABLE by Edmund K. Faltenmayer, Macmillan-Collier, N.Y., \$1.95.
8. CITIES: A SCIENTIFIC AMERICAN BOOK by the editors of SCIENTIFIC AMERICAN; Knopf, N.Y., 1965, \$2.95.
9. THE LAST LANDSCAPE by William H. Whyte; Doubleday-Anchor, Garden City, N.Y., 1968, 1970, \$1.95.
10. MAN-MADE PHILADELPHIA by Richard S. Wurman and John Gallery; M.I.T. Press, Cambridge, 1972, \$3.95. Emphasizes the use of very detailed maps to understand a city and the interrelationships of its various facets.
11. ONLY ONE EARTH by Barbara Ward and Rene Dubos; Norton, N.Y., 1972, \$6. This environmental report, drawn up for the Stockholm Conference and drawing upon exhaustive scientific resources, deals with "Facts of Urban Growth, The Center City, Suburbia" among other subjects.
12. THE CITY IS THE FRONTIER by Charles Abrams; Harper and Row, N.Y., 1967, \$1.95.
13. THE QUALITY OF THE URBAN ENVIRONMENT: ESSAYS ON "NEW RESOURCES" IN AN URBAN AGE, edited by Harvey S. Perloff for Resources for the Future; Johns Hopkins, Baltimore, 1970, \$6.50.

Publications

1. HOUSING, BUILDING AND PLANNING: Problems and Priorities in Human Settlements, Report of the Secretary-General; United Nations General Assembly A/8037, Aug. 21, 1970.

2. URBA - 2000, a project summary prepared for a series of ten 57-minute films on things that cities are doing right, and to be completed by spring 1975. The summary describes what the films are about; the films to be produced and distributed by the National Film Board of Canada. URBA - 2000 may be obtained from Societe Nouvelle/Challenge for Change, P.O. Box 6100 - P31, Montreal, 101, Quebec.
3. ON FOOT DOWNTOWN, a joint report by Toronto's Commissioner of Public Works, Chief Planner, Commissioner of Development and City Solicitor, Dec. 1970, second edition Feb. 1973. The objectives of the report were to examine the needs of pedestrians in downtown Toronto and then recommend a comprehensive system to meet those needs.
4. OBJECTIVES FOR THE AREA BOUNDED BY DUNDAS, YONGE, QUEEN AND BAY STREETS by the Toronto Planning Board, City Hall, Toronto 100, May 11, 1971. A list of development objectives disseminated in order to promote public discussion of the proposed project.
5. TOWARDS A PART II PLAN FOR SOUTH-EAST SPADINA, a City of Toronto Planning Board Publication, Report Twok 1972, Tentative Planning Proposals.
6. URBAN CANADA: PROBLEMS AND PROSPECTS, a report prepared for the Canadian Minister of Housing, Central Mortgage and Housing Corporation, Ottawa 7, Canada, Dec. 1970, \$2.
7. ENVIRONMENTAL PLANNING AND GEOLOGY, Proceedings of a Symposium on Engineering Geology in the Urban Environment arranged by the Association of Engineering Geologists for their October 1969 meeting in San Francisco; published by Geological Survey, Department of the Interior, and the Office of Research and Technology, Department of Housing and Urban Development; edited by Donald Nichols and Catherine Campbell; available from U.S. Government Printing Office, Washington, D.C. 20402, \$2.75.
8. URBAN BEAUTIFICATION AND IMPROVEMENT PROGRAM, 1966, by Metropolitan Area Planning Council, 44 School St., Boston, Mass. 02101.

Articles

1. "Walt Disney World -- No Mere Amusement Park," ARCHITECTURAL FORUM, June 1972. An extensive examination of the planning, transportation, technology, new town, and other aspects of the Disney Center in Florida.

2. "Mickey Mouse Teaches the Architects" by Paul Goldberger, THE NEW YORK TIMES MAGAZINE, Oct. 22, 1972. On the many conceptual and technological innovations embodied in Walt Disney World.
3. "Toward an Urban Ecology" by C.S. Holling and Gordon Orlans, BULLETIN OF THE ECOLOGICAL SOCIETY OF AMERICA, summer issue, 1971. The report of two ecologists after an examination of ecology's relationship to urban ecology.
4. "Are Our Cities Doomed? Yes" by Eugene Rasking, "No" by Samuel Tenebaum, "What Can Be Done?" by Richard Reeves, THE NEW YORK TIMES, May 2, 1971.
5. "The Outer City," series of five articles by Jack Rosenthal, Douglas Kneeland, Paul Delaney, John Herbers, Linda Greenhouse, THE NEW YORK TIMES, beginning May 30, 1971.
6. "Large Suburbs Overtaking Cities In the Number of Jobs Supplied" by Jack Rosenthal, THE NEW YORK TIMES, Oct. 15, 1972.
7. "New Boston Center: Skillful Use of Urban Space" by Ada Louise Huxtable, THE NEW YORK TIMES, Sept. 11, 1972.
8. "Innovative Design and Planning Take Shape in Lower Manhattan" by Ada Louise Huxtable, THE NEW YORK TIMES, June 8, 1973.
9. "Study Finds City's Future 'Very Much Alive'" by Murray Schumach, THE NEW YORK TIMES, Nov. 20, 1972. The study is "New York Is Very Much Alive: A Manpower View" by a group of social scientists at Columbia University.
10. "Nine of 10 Found Unhappy Over The City's Rule," the NEW YORK DAILY NEWS, July 5, 1972. A 33-page Gallop poll shows that nine of 10 New Yorkers are dissatisfied with the performance of their city government. Nearly three-quarters want the structure of government changed, and more than six of 10 favor some form of decentralization.
11. "City of Light: Study Takes a Dim View" by Nan Robertson, THE NEW YORK TIMES, May 21, 1973. A 2,000-page French Government-ordered study finds that contemporary Paris is being run to benefit commercial developers and because of this the French capital's cultural heritage and ambience of charm is being eroded, and that the city's dominance as a world cultural center is passing to London and other cities.

12. "The American City -- A Forecast" by Edgardo Contini, THE FUTURIST (magazine of World Future Society: An Association for the Study of Alternative Futures, P.O. Box 19285, Twentieth St. Station, Washington, D.C. 20036), Feb. 1972. A civil engineer and planner states thesis that city crisis can be solved, but only if Americans move away from their commitment to private ownership and home rule, and also recognize the direct relationship of cities to their transportation systems.
13. "The Cities: A Failure Everywhere," TIME, Sept. 12, 1969.
14. "The Twin Cities Area Tries a Farsighted Approach to Dealing with Regional Environmental Problems," CF LETTER, Oct. 1971. The Conservation Foundation, 1717 Massachusetts Ave., N.W., Washington, D.C. 20036.
15. "The Decline and Decline of New York" by Roger Starr, THE NEW YORK TIMES MAGAZINE, Nov. 21, 1971.

Films*

1. THE CITY AND ITS REGION, 28 min., b & w, purchase from Sterling Educational Films \$160, produced in 1964. This is one of a series of films based on Lewis Mumford's book, THE CITY IN HISTORY. The film's theme is that the city must live in harmony with its surrounding countryside. The city must limit its growth and land must be treated as a public possession, not material for the developer. Jr. high school to adult.
2. A CITY IS TO LIVE IN, 54 min., color and b & w, purchase from BFA Educational Media \$575 for color, \$275 for b & w; rental \$40 for color or b & w; produced in 1968. The film examines the ills of Cleveland, which include extremely low return of its tax money and the neglect of surrounding suburbia which uses Cleveland's industrial and municipal facilities. Jr. high school to adult.
3. DOWNTOWNS FOR PEOPLE, 25 min., color, purchase from Enterprise Productions \$275, rental \$35, produced in 1971. An excellently produced film on the virtues of malls. Jr. high school to adult.
4. COSMOPOLIS, 52 min., color, purchase from Contemporary Films-McGraw-Hill \$600, rental \$35, produced in 1969 by ABC News. Worth seeing for its wealth of information and discussion of (although not necessarily recommendations for) possible solutions. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

5. VIVRE SA VILLE, 18 min., color, purchase from National Film Board of Canada \$200, rental \$15, produced in 1968. Concentrates on Montreal and Quebec, and stresses need for preserving old sections of those cities. Jr. high school to adult.
6. MEGALOPOLIS, 30 min., color, purchase from Indiana University \$315, rental \$11.50. Produced by WTTW, Chicago, the film proposes that city planners, architects, and builders must explore new attitudes and consider new habitats to urban/suburbia.
7. CITY LIFE, 30 min., color, purchase from Indiana University \$315, rental \$11.50. Produced by WTTW, Chicago for Public Broadcasting, the film points to the individual's role in the community and the community's role in maintaining a viable city life.
8. THE PEDESTRIAN STRIKES BACK, 25 min., color, rental \$5 from Portland Cement Assn., produced in 1967. On the malls of Burbank, Pomono, and other cities in Southern California. Jr. high school to adult.
9. THREE CURES FOR A SICK CITY, 30 min., b & w, purchase from Indiana University \$125, rental \$6.75, produced in 1964. Three case studies showing urban renewal in Washington, D.C. are presented in this film. The approach is critical of the fact that renewal often benefits the rich and not the poor.
10. THE CITIES: TO BUILD THE FUTURE, 54 min., color and b & w, purchase from BFA Educational Media \$575 for color, \$275 for b & w, rental \$40 for color or b & w, produced in 1968. This documentary examines two schools of thought on the city problem: the "pile 'em up" theory of high rise apartments and the "move 'em out" theory of new towns, and neither solution seems very satisfactory. Jr. high school to adult.
11. RESTON: A PLANNED COMMUNITY, 10 min., color, purchase from Sterling Educational Films \$135, produced in 1967. A documentary on the celebrated "new town" just a year after its completion. Jr. high school to adult.
12. CITIES -- THE RISE OF NEW TOWNS, 60 min., b & w, purchase from Indiana University \$200, rental \$12, produced in 1966. An examination of new towns Vallingby, Sweden; Columbia, Maryland; Reston, Virginia. Adult.

13. CITIES IN CRISIS: WHAT'S HAPPENING, 21 min., color, purchase from Universal Education and Visual Arts, produced in 1969. A visual documentary of the crass and ugly in contemporary cities. Jr. high school to adult.
14. A TOWNSCAPE REDISCOVERED, 29½ min., color, purchase from CCM Films \$350, rental \$32.50, produced in 1967. The story of the restoration of downtown Victoria, British Columbia. Jr. high school to adult.
15. VISIT TO A SMALL VILLAGE, 12 min., color, purchase from Association-Sterling Films \$144, rental \$10. Ghana plans to stop the migration, which is destroying a village, to a city which is overcrowded. Jr. high school to adult.
16. THE ABANDONMENT OF THE CITIES, 11 min., color, purchase from NBC \$180, rental \$10, produced in 1971. This film concentrates on the abandonment of housing in the Brownsville section of Brooklyn and in St. Louis, indicting greedy landlords for playing an important role in the decay of cities. Jr. high school to adult.

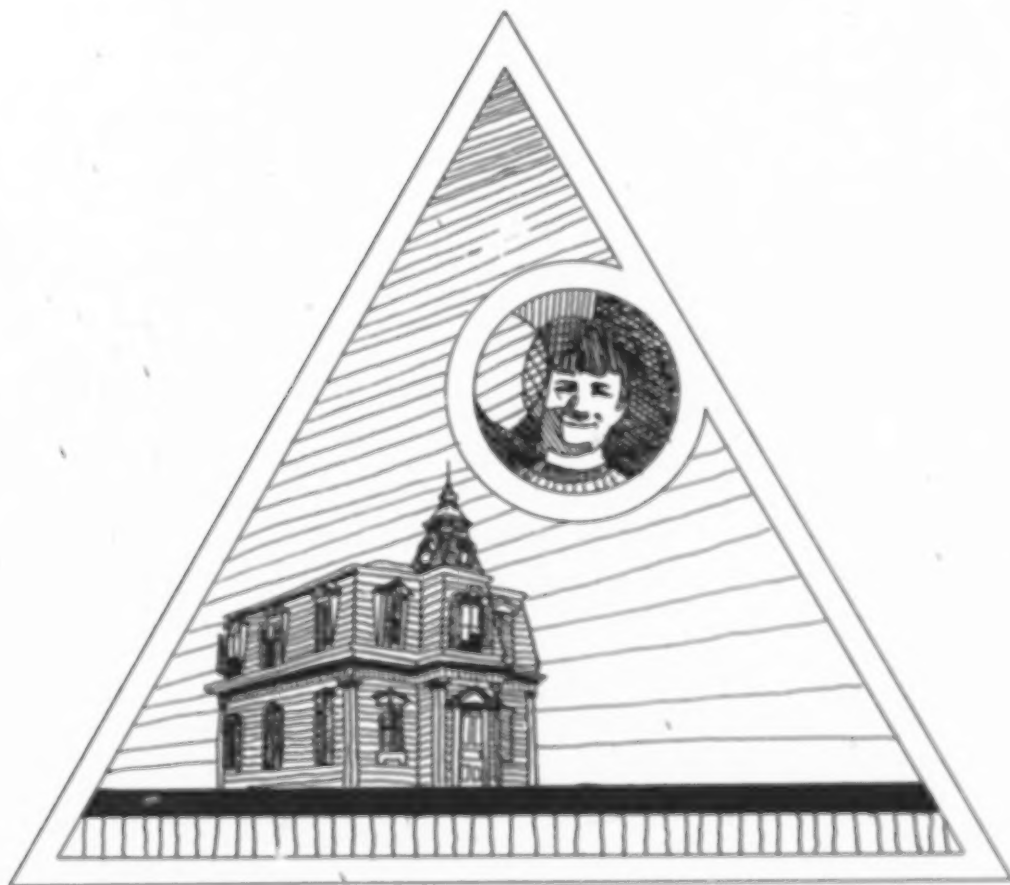
Organizations

1. American Institute of Planners
917 15th St., N.W.
Room 800
Washington, D.C. 20005
(Professionals either in or out of government engaged in comprehensive planning.)
2. American Society of Landscape Architects
2013 Eye St., S.W.
Washington, D.C. 20006
3. American Society of Planning Officials
1313 East 60th St.
Chicago, Ill. 60637
(To foster best techniques and decisions for planned development of communities and regions.)
4. Regional Plan Association
235 East 45th St.
New York, N.Y. 10017
5. Open Space Institute
145 East 52nd St.
New York, N.Y. 10022
(Publishes material on ways that community leaders can preserve open space.)

Government Agencies

1. Department of Housing and Urban Development
451 7th St., S.W.
Washington, D.C. 20410
2. Community Planning and Management
Department of Housing and Urban Development
451 7th St., S.W.
Washington, D.C. 20410
(Directs administration of community planning programs
for well-balanced, environmentally healthy communities.)
3. Urban Beautification and Improvement Program
Department of Housing and Urban Development
451 7th St., S.W.
Washington, D.C. 20410
(Provides grants to assist local programs of urban
beautification and improvement of urban areas.)
4. New York State Office of Planning Services
488 Broadway
Albany, N.Y.

THINGS WORTH KEEPING



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THINGS WORTH KEEPING

Perspective

It was a sultry July day. I climbed the Palatine Hill in Rome, tracing the succession of Caesars as each built his own palace up the side of the hill facing the Forum and then over the top to the promontory overlooking the Circus Maximus. It was easy to understand why the rulers of the civilized world had chosen this location. The most delightful zephyrs tempered the Roman heat, transforming an oppressive day into an empyrian experience. It occurred to me that if this most choice site somehow were transposed to an American city, the prerogatives of the dead Caesars would have succumbed to more pragmatic services for the living...and to the more profitable returns of high rise apartments.

Perhaps the past in the United States is not old enough, not venerable enough to warrant the solicitude it gets in the "Old World." Perhaps the American faith in and emphasis on the future is what has produced the industrial leadership of the world, and thus presents a valid reason for not looking backwards. Yet, the American past is an important part of world history; the United States, the world's oldest constitutional democracy, has inspired the formation of many other states in today's world. Moreover, the future does not exist in isolation, but grows out of the past.

Historian Arthur Schlesinger, Jr., discussed the relevance of the American past to our contemporary society in a plea to save the historic Hudson Valley around Tarrytown from the desecration of an expressway (it was saved by a precedent-setting environmental lawsuit). Historian Schlesinger enumerated some of the sites in the area immortalized by Washington Irving and then went on: "Some will regard preoccupation with the past as a matter of sentimentality. They could not be more wrong. The present emerges from the past, and a sense of history is one of the means by which a people achieve purpose and strength for the future... The benefits of the past may not be so tangible as the benefits of superhighways, but it is precisely a perception of these impalpable values that our confused and turbulent society needs today... As we destroy the heritage of the past, we destroy a bit of ourselves, and we impoverish the future."

Rearranging Washington's Birthday, Memorial Day, and Veterans Day may have been good for business -- retail and resort -- in providing 3-day weekends; it may have been good for merchants, managers, and workers. But did the Congress of the United States, often on the lookout for un-Americanism, consider the cost of tampering with those dates for Americans? Did the Congress, often a forum for outspoken patriotism, weigh the effect of its violence to our traditions upon patriots?

Which traditions should be preserved, which discarded; which heritage valued, which sacrificed; which physical link with the past saved, which destroyed? These are questions dealt with in THINGS WORTH KEEPING. This broadcast is a reminder that our cultural environment, what we have inherited and preserved from the human beings who have gone before us, shapes us fully as much as or more than the physical environment in which we exist today.

The Broadcast: THINGS WORTH KEEPING

The broadcast is based on the belief that there is an esthetic environment as well as a physical environment; this means that there can be an esthetic pollution as well as physical pollution. Essentially, these esthetic considerations concern art and architecture. They are very much bound up in the interplay between past and present, between heritage and continuity and contemporary economic pressures. The antiquity of Abu Simbel, the seamy vitality of Picadilly Circus, the charm of Paris: certainly, they are worth keeping. On the other hand, change is inevitable and a sign of the continuing vitality of human life and civilization. How does a society go about deciding which things are worth keeping and which ones can be removed?

The Plaka section of Athens offers a nice case in point for this conflict. The Plaka, at the foot of the Acropolis, is 19th century in character and the most vital part of the Greek capital with shops, cafes, and entertainment places. Archeologists are sure that the Plaka is built upon an important part of ancient Athens, and there is pressure to unearth these ruins which have so much to tell about the early beginnings of Western civilization. However, the price for uncovering these archeological treasures would be the demise of the vital center of the present-day city. The Greek city planner, Constantinos Doxiadis, says destruction of the Plaka would leave Athens a city with only two characteristics -- ancient ruins and 20th century architecture. Others argue that with the current state of the city's air pollution, which is eroding the Acropolis, it would be an act of prudence to allow the other ruins to remain buried, and protected.

A chemistry professor at New York University, Seymour Lewin, however, has discovered ways to stop the processes of stone decay because of air and water pollution. Professor Lewin's attention has been directed toward Abu Simbel, the great tomb of the ancient Egyptian Pharaoh Ramses II that was dismantled and removed from its original site on the Nile River before the location was flooded by the waters of man-made Lake Nasser. Then the massive dismembered parts were cemented back together again at a new site. Chemical deterioration of the cement, apparently triggered by pollution, has been detected.

One positive aspect of the pollution-caused deterioration of many of our oldest monuments has been to excite a public awareness of this new and modern type of cultural threat, an awareness that is introducing preservative action. To save Venice which is being undermined and worn away by erosion from sea waters and air pollution, for instance, the Italian Government has pledged more than \$510 million. UNESCO is coordinating an international effort to save the unique city.

In Chicago, a novel program has been advanced to save some valuable 19th century structures from being razed. The Zoning Bank is an unusual answer to those people who say "you can't stand in the way of progress." These architectural gems from the last century are threatened because land in Chicago's downtown Loop has become so valuable that its owners could receive a far greater return in rentals or sales by tearing down the relatively small buildings to replace them with huge and more remunerative skyscrapers. The economic argument is a formidable one. But under the Department of the Interior's Zoning Bank proposal, those property owners who retain their small structures are given credit in the bank for the extra number of stories they legally could build in that zoned area. The Zoning Bank keeps a deposit of these unbuilt stories. Then when someone wants to construct a building higher than permitted by zoning restrictions, he is permitted to do so -- provided that he pays for the right to the additional floors to the deprived landowner who has voluntarily kept an historic structure. In this way, the deprived landowner is compensated for his good works.

Another important way to preserve these artful structures is to see that they house and serve vital contemporary activities; in other words, that they continue as useful buildings and are not simply preserved as fossilized museums. This has been the strategy of James Biddle who heads the National Trust for Historic Preservation. As Biddle sees it, the main trouble with restoration, in general, is that too often structures are preserved as museum pieces, lifeless, their inherent usefulness ignored. His approach is to see to it that preserved buildings

are offered to groups for meetings, with rentals helping to pay for upkeep. In Charleston, South Carolina, historic old buildings in the waterfront area have been rejuvenated as well as renovated by an influx of young people which has transformed the section from rundown to chic.

An early significant and formalized start to the tradition of preserving historic buildings of national and international importance came into being in England with the National Trust for Places of Historic Interest and Natural Beauty in 1895. This movement sprang from the conservative impulses and the feeling of noblesse oblige of British nobility. This tradition was carried on even when the impoverished noblemen were replaced by nouveau riche industrialists as the caretakers.

In Japan, cultural preservation has been extended to people. Artisans who practice such ancient crafts as sword-smithing, pantomime, and pattern-making have been designated living national monuments -- "holders of important intangible cultural properties." Unfortunately, they (the holders, that is) will not be preserved for long, but, hopefully, their craftsmanship will be.

What can I do?

A few years back, homeowners in the historic Stockade section of Schenectady -- site of the city's original nuclear stockade beginnings in the 1700's -- formed an association to save the historical character of their area. They decided that while owners could alter the interiors of their homes to suit their tastes, all should preserve the exteriors of their buildings. The pleasing results of this collective action are not only one of the most attractive areas in the city of Schenectady today, but also one of the most desirable -- meaning enhancement of land values, an improvement even the cultural philistine savors.

A similar transformation, brought about by the individual actions of private citizens, upgraded Georgetown from a rundown section to a prestigious and wealthy suburb of the nation's capital. The impetus for these changes lay in the desires of some citizens to preserve or enhance their esthetic surroundings and to do so by maintaining their architectural heritage. Afterwards, this emphasis on environmental values was followed, as might the day, by an escalation of economic values -- as always, money being a neutral and impartial reflection of other human values.

With a quickening interest among Americans in their cultural past, these examples show what private citizens can do by themselves and for themselves.

The arrival of volunteer workers, including many young people from the United States, to help restore a Florence ravaged by flood waters is one of the inspiring episodes of contemporary times. No city serves as a greater repository for the precious past, for the intangible as well as the tangible things worth keeping--the works of Michelangelo, da Vinci, Botticelli; the architecture of Brunelleschi; Giotto; the awareness that here the historic roles of Dante, Machiavelli, the Medici, and Galileo were played; the sense of how Florence influenced the birth of the Renaissance; and, perhaps especially, the feeling of the past that pervades the present-day city.

You can remind yourself, as an antidote to the American obsession with the future and youth, that the past and the old can give valuable instruction for survival. New is not necessarily better, only different. Planned obsolescence is a device to spur, artificially, economic demand (with accelerated consumption of resources). History and tradition are links to the past, guarantors of continuity and orderly procession in human affairs, guardians against alienation. They are necessary guides to a safe transition into the future.

The saving of the world's cultural heritage, at last, will be undertaken in a methodical, organized fashion. UNESCO, the United Nations Educational, Scientific and Cultural Organization, is organizing a World Heritage Committee composed of nations that sign a World Heritage Convention to preserve worthwhile things in the world's culture. As part of its work, the World Heritage Committee will help set up national and regional centers to train staff and specialists in the field of identifying, protecting, and rehabilitating our cultural and natural heritage. You can become a part of this effort.

Under Organizations in the following section, you will find several groups affording you the opportunity to participate in saving valuable parts of our human heritage.

For further information

Books

1. GUIDE TO HISTORIC PRESERVATION, HISTORICAL AGENCIES, AND MUSEUM PRACTICES: A SELECTIVE BIBLIOGRAPHY compiled by Frederick L. Rath Jr. and Marilyn Rogers O'Connell; New York State Historical Association, Cooperstown, N.Y., 1970, \$12. This is the only extensive reference guide in the field, listing organizations, bibliographies and detailed instructions in how to do it.

2. PRESENCE OF THE PAST: A HISTORY OF THE PRESERVATION MOVEMENT IN THE UNITED STATES BEFORE WILLIAMSBURG by Charles Hosmer Jr.; Putnam, N.Y., 1965.
3. WITH HERITAGE SO RICH: A REPORT by the U.S. Conference of Mayors; Random House, N.Y., 1965. History of preservation movement carried to a later date.
4. GOD'S OWN JUNKYARD: THE PLANNED DETERIORATION OF AMERICA'S LANDSCAPE by Peter Blake; Holt Rinehart and Winston, N.Y., 1964, \$2.95.
5. THE ARTS AND MAN a compilation of essays by UNESCO; Prentice-Hall, Englewood Cliffs, N.J., 1969, \$12.95. Views of the role and function of arts in society.
6. VENICE IN PERIL published by International Fund for Monuments, Inc.; N.Y., 1970, \$5.95. The story of the threat to Venice, its physical deterioration, and what can be done about it.
7. DESIGN WITH NATURE by Ian McHarg; Natural History Press, Garden City, N.Y., 1969, 1971, \$5.95. A landscape designer who considers cultural and historical values as well as natural, hydrological, topographical, commercial, and economic parameters in planning for development.
8. AMERICA'S HISTORYLANDS, TOURING OUR LANDMARKS OF LIBERTY by National Geographic Society; Washington, D.C., 1967.

Magazines

1. AMERICAN HERITAGE, published bimonthly, 383 West Center Street, Marion, Ohio 43303. Sponsored by the American Association for State and Local History, and the Society of American Historians.
2. THE COURIER, published monthly by UNESCO, Place de Fontenoy, Paris 7e, devoted its Dec, 1968, issue to "Venice in Peril" and has given prominent attention to a variety of cultural subjects in other issues.
3. HISTORY NEWS, published monthly by the American Association for State and Local History (see Organizations). News, new ideas, reviews of books, and audiovisual materials.

Articles

1. "Venice Preserved," TIME, June 11, 1973. A summary of steps being undertaken to save Venice.
2. "Conference in Paris Starts Work on Plan to Preserve Venice," THE NEW YORK TIMES, Jan. 25, 1973. Planning the international effort under the coordination of UNESCO; the plan was approved in April 1973.
3. "Foul Air Masks Ordered Near Venice," by Paul Hofmann, THE NEW YORK TIMES, Oct. 4, 1972.
4. "Rome Moves to Prevent Decline of Colosseum" by David L. Shirey, THE NEW YORK TIMES, Oct. 4, 1972.
5. "City of Light: Study Takes a Dim View" by Nan Robertson, THE NEW YORK TIMES, May 21, 1973. A 2,000-page study concludes that Paris now is run for the sole benefit of commercial developers and that the city's cultural dominance is passing to London and other cities.
6. "What Would You Do With, Say, Staten Island?" by Ian McHarg, NATURAL HISTORY, April 1969. A specific proposal incorporating cultural and historic values into development plans.

Films*

1. STOP DESTROYING AMERICA'S PAST, 22 min., color, Contemporary Films, \$295, rental \$26, produced in 1971. The film implies that until we learn to respect our past, we will not take pride in our future. Jr. high school to adult.
2. VENICE BE DAMNED!, 52 min., color, NBC, \$500 rental \$25, produced in 1971. A highly praised NBC documentary on the predicament of Venice. Jr. high school to adult.
3. VENICE - THE VANISHING LADY, 44 min., color, Time-Life Films, \$450, rental \$45. The Venice story told by BBC-TV. Jr. high school to adult.
4. VENICE POLLUTED, 16 min., color, Texture Films, \$220, rental \$25, produced in 1971 in cooperation with Italian Television. The Venice story in a shorter version. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

5. RETURN TO FLORENCE, 27 min., color, produced by UNESCO, \$220, rental \$11, United Nations. A film about the restoration of the city and its treasures following the devastating floods of November 1966.
6. GLEN CANYON, 26 min., color, Association-Sterling Films, \$315. The Sierra Club film shows the gorgeous stretch of the Colorado River now inundated by Lake Powell; it (the film) argues that Glen Canyon could have been saved through developing alternate sources of power generation. Jr. high school to adult.
7. THE GRAND CANYON, 26 min., color, Association-Sterling Films, \$315. This Sierra Club film shows why Grand Canyon is worth keeping. All audiences.
8. TWO YOSEMITES, 10 min., color, Association-Sterling Films, \$125. This Sierra Club film shows the beauty of Yosemite falls and valley and the environmental blight inflicted upon a twin site not far away by its conversion into a reservoir to provide water power. Jr. high school through adult.
9. THE REDWOODS, 20 min., color, Association-Sterling Films, \$125. This Sierra Club film won an Oscar as the best short documentary of 1968; it shows why the redwoods were worth preserving in a Redwoods National Park. Jr. high school through adult.
10. REDWOODS - SAVED?, 3½ min., color, Association-Sterling Films, \$47.50. A sequel to THE REDWOODS showing destruction of coastal redwoods adjacent to Redwoods National Park.

Organizations

1. UNESCO
Department of National and Cultural Heritage
Place de Fontenoy
Paris 7e, France
2. National Trust for Historic Preservation
Decatur House
748 Jackson Place, N.W.
Washington, D.C. 20006
(A private organization chartered by Congress to preserve buildings, sites, and objects significant in American history or culture, and to encourage public efforts at preservation. The trust has 30,000 individuals and 1,500 groups as members. Usually, it aids local groups in preservation work. The Trust is financed by private donations and members' dues; it is eligible for matching funds from the government.)

3. American Association for State and Local History
1315 Eighth Avenue South
Nashville, Tenn. 37203
(A nonprofit, educational organization to promote knowledge and appreciation of localized history in the United States and Canada; serves individuals, professional historians, groups; has an information clearinghouse, training and awards programs.)
4. International Council of Monuments and Sites (ICOMOS)
ICOMOS Secretariat
Palais de Chaillot
Aile Paris
Place du Trocadero
Paris XVIe, France
(An international organization designed to link individuals and public groups interested in preserving, studying, and restoring monuments and sites.)
5. American Association of Museums
2233 Wisconsin Avenue, N.W.
Washington, D.C. 20007
6. Canadian Museums Association
Room 505
56 Sparks Street
Ottawa 4, Canada
7. National Trust for Places of Historic Interest and Natural Beauty
42 Queen Anne's Gate
London, S.W. 1, England

Government Agencies

1. National Park Service
Interior Building
C St. between 18th and 19th, N.W.
Washington, D.C. 20240
(Makes decisions and sets policy for establishing national historic sites. The service was established in 1916 to administer the small number of parks and monuments then in existence. The Historic Sites Act of 1935 established "a national policy to preserve for public use, historic sites, buildings and objects of national significance for the inspiration and benefit of the people of the United States." The National Historic Preservation Act of 1966 enlarged the scope of the national preservation policy. A National Advisory Council on Historic Preservation was appointed, a system of matching grants-in-aid to the states and the National Trust for Historic Preservation was set up, and an Office of Archeology and Historic Preservation

was organized within the Service to manage the increased responsibilities. The service manages national parks, monuments, historical parks, military parks, battlefield parks, historic sites, memorials, cemeteries, memorial parks, battlefields, battlefield sites, seashores, parkways, recreation areas. The service operates an interpretive center and a museum laboratory in Harpers Ferry, West Virginia, for the design and construction of exhibits and for the conservation and restoration of paintings and historical objects.

THE KEEPING OF THE GREEN



THE KEEPING OF THE GREEN

Perspective

"Although we will not again be hunters," anthropologist Carlton Coon wrote*, referring to our ancestral way of life before the invention of agriculture 8,000 or 10,000 years ago, "our biological make-up is the same as theirs and our biological needs were determined by natural selection over hundreds of thousands of years. We can live and work most happily and efficiently if we reproduce, with modern improvements, some approximation to our ancestors' living conditions. A hunter needs space to move around in. He needs trees and grass and rocks and streams; he needs the presence of birds and animals, and the opportunity for exercise and recreation."

Human beings also have the antlike capacity to survive -- and thrive -- packed into cities, as we can see from our recorded history and from Hong Kong or New York today. But, given the choice and chance, most people will opt for an environment that gives them living room, and we have seen the great migration to the suburbs during the past generation. This phenomenon, this prodigious dispersion of the population seems to be a determination to return to nature, without giving up urban amenities. How successful this has been depends upon your point of view and particular piece of real estate.

There is another solution to the problem: bringing nature to the city. It is not a new strategy, but it is badly in need of resuscitation because it has suffered neglect in so many urban-industrial areas. Anyone who has lived on the concrete and asphalt rock of Manhattan Island appreciates the spirit-saving value of a nearby park, particularly that great green breathing space in the center, Central Park. There are some inhabitants of Manhattan, in fact, who credit the park's architect Frederick Law Olmsted with being the savior of Manhattan (Olmsted also was responsible for Riverside and Morningside parks, Prospect Park in Brooklyn as well as about 75 parks in Chicago, Boston, Milwaukee, Buffalo, Louisville, Montreal, and other cities). For survival in the unrelenting artificial environment is difficult to envision without the beneficent presence of the park. In recent years, some public-spirited citizens have donated funds for the creation of small "vest pocket" parks as valuable land became available in the midtown area. However, in general, New York City has not paid sufficient attention to its parks. It is reasonable to assume that if the city assigned

*THE STORY OF MAN by Carlton Coon, Knopf, N.Y., 1954, \$6.75.

a larger share of its budget to the Parks Department, it would not have to give such an egregious amount to the Police Department.

London, England indicates that such theorizing is more than speculation. London, which has kept its green, also has kept its cool. The English capital, a summit of civilization for centuries, is esteemed for the civility and law-abiding, nonviolent character of its citizens. For just as long, London has vied with its archrival on the Continent, Paris, as prime world center of culture. Just recently, a French Government-ordered study concluded that the French capital is being run today for the sole benefit of commercial developers. The report says that present authorities have failed to consider that the economic future of Paris is dependent upon its cultural influence and heritage, its social atmosphere, and its quality of life. The dominance of Paris as world capital of culture, the report concludes, is passing to London.

THE KEEPING OF THE GREEN reports on the city which has won preeminence for its parks and greenbelt among the other aspects of its culture.

The Broadcast: THE KEEPING OF THE GREEN

The term "greenbelt" has a precise meaning in England. A greenbelt is a large swath of permanent open space which surrounds a city and upon which the government has placed restrictions against development. Such a circle of greenery girds the great metropolis of London. Within this perimeter, the city is liberally endowed with urban breathing spaces -- parks such as Kensington Gardens, Hyde Park, Regents Park, St. James, and many others. Many of these green areas in and around London managed to remain inviolate because they were the preserves of royalty or nobility. Even today, Princess Margaret maintains a home within Kensington Gardens. And so children, nannies with their charges, workers on their day off as well as members of the social upper crust all mingle by a serpentine lake or near the shadow of the princess' home, taking their rest and restoration. On Sunday afternoons, these park pilgrims are treated to a concert from the bandstand.

Some urban experts have pointed to these parks as pressure valves, escape points for the frictions and frustrations, antagonisms and aggressions that build up when some 8 million human beings concentrate within a relatively small area. And, indeed, London through this era of violence and unrest has maintained a reputation for unruffled amenities, courtesies, absence of public displays of anger, and a low incidence of violent crime. London is suffering from some of the growing or transition pains afflicting other urban centers in this modern age; still, it has not succumbed to the kind of decline that has troubled other cities.

And so, THE KEEPING OF THE GREEN looks closely at this world center that evidently has been doing some things correctly to learn the lessons that might help to improve the quality of other urban lives. And this means billions of lives since, by the turn of the century, it is estimated that nearly two-thirds of mankind will live in urban areas.

Beyond the greenbelt, England has embarked on the New Towns program, the construction of limited, environmentally sound and pleasing satellite cities. This is a program which has received wide attention and the beginning of imitation.

In contrast to the ancient durability and enduring livability of London, Ube in Japan is a parable of the modern age. A century ago, Ube was a small fishing village. Then it began to grow with the quickening tempo of pre-World War II Japan, a fatal growth as it turned out, for Ube became important enough to attract the attention of U.S. bombers. The city was destroyed during the Second World War, only to rise like the mythical phoenix from its own ashes in the remarkable industrial efflorescence of the postwar period. A petrochemical industry took over from coal mining and fishing as the leading industry. Soot began falling on Ube, the black snow of a changed environmental climate. In the 1950's, Ube was Japan's leading city for air pollution.

Since then, the one-time pure fishing village has been undergoing still another transfiguration. The people of Ube began by clearing small parcels of land for trees and flowers. The campaign gained such popularity and the civic spirit gained such momentum that gardens began to sprout even in factory districts. Ube -- with a profusion of greenery and parks and flowers -- once again became a livable city. But today a new environmental threat from sulfur dioxide must be met, a reminder that environmental battles are never won permanently. Still, the citizens of Ube have shown the will and found the way to free their city from industrial blight, and that record is a good augury for the future.

The Ruhr area in West Germany does not have a tradition for environmental respect, only single-minded concentration on industrial production. And the Ruhr has contributed immensely to West Germany's industrial leadership and postwar prosperity. But, if it is a nice place to work, you wouldn't want to live there. However, this characteristic state of affairs may be changing now, for the managers of the great industrial complex are trying to improve their area environmentally, giving thought to those natural places that have survived -- providing greenways for people as well as Volkswagens. THE KEEPING OF THE GREEN examines this pioneering effort.

What can I do?

Frederick Law Olmsted, the designer of Central Park, wrote: "A man may buy and fit up a costly house, but if, after he has done so, he finds coal and ashes scattered over his carpets, if decorated ceilings are stained and marred, if pictures are defaced, if books and dishes are piled on his chairs, windows and doors kept open during storms, beds used as tables and tables as beds, and so on, all that he has obtained for his expenditure will be of little value to him for the time being, and the possibility of its ever again being made of much value will lessen with every day that such misuse is suffered, through inefficiency of housekeeping, to prevail."

Today, Central Park, Olmsted's masterpiece, is suffering from that very lack of housekeeping. Where there had been 46 gardeners for the park's 840 acres after World War II, today there are three gardeners. Only two crews of climbers and pruners are assigned to maintain trees in the entire borough of Manhattan. Ninety-five percent of the park's 100,000 trees need attention, 25 percent immediate attention if they are to be saved (10 percent already are beyond saving). If the mature trees are not saved, the park may never again get such large replacements because younger trees no longer can grow as big because of air pollution.

This sad story shows how the Parks Department rates in the municipal hierarchy in New York, and in other cities, too. Municipal policy reflects what the public wants or what people will tolerate. You are the people. You can begin the reevaluation through the political process. Support leaders who show that they understand the value of a natural setting in the urban scene. Vote for officials who understand that greenbelts as well as greenbacks have something to do with the quality of life -- that development does not always have to imply commercial development.

Discourage vandalism and littering, private expressions that reflect official neglect and public indifference. Set a good example. You can stoop to pick up someone else's wrapper or soda can. Help clean your park and keep it clean. A good example can be contagious; it can help to turn things around.

The point is, parks are not free. Not only do they require an important part of the public tax funds, but also constant attention, care, and love. See the recommendations listed under PARKS FOR PEOPLE, the first book in the next section (see also THE CITY WITH A FUTURE).

For further information

Books

1. PARKS FOR PEOPLE by Ben Whitaker and Kenneth Browne; Seeley Service & Co., London, 1971, about \$5.50. Many of the points and recommendations made in this brief book are used in the broadcast. Some of the book's main suggestions are: (1) The popular use of parks is the best way of policing them. (2) The planning of parks should take into account the needs of people in the contiguous areas from which its human users will be drawn. (3) Public transit should provide ready access to the park because most park visitors arrive by foot. (4) Many more parks should be lit in the evening. (5) Neighborhoods can be encouraged to feel possessive about their local parks by forming a committee to help look after it. (6) Planning should be the servant of people's enjoyment and should never supersede it. (7) Vigilance is necessary to make sure that open spaces are not nibbled away by road developments or buildings. (8) Roads and traffic should, if possible, be kept out of parks; where impossible, roads should be sunk or tunneled. (9) Open spaces should form part of complete traffic-free walks across cities. (10) The noise of traffic can often be disguised with the sounds of running water and fountains. (11) Intelligent planning and durable materials can minimize the temptation for vandals. Poorly maintained and dirty property attracts the most vandalism. (12) Tivoli in Copenhagen shows that a popular pleasure park need not be ugly. (13) In the search for land for new parks, areas held by government agencies, hospitals, and prisons in cities should be considered. Derelict land often presents possibilities. Roofs of buildings can be the sites of gardens. Disused cemeteries may be adapted for the living. Experiments should be made in having orchards, woods, and farms on land in cities. (14) Rivers and canals are cities' most wasted assets. Linear parks could be laid out along their banks. The container revolution gives the opportunity to make use of abandoned docks. (15) New parks could be financed by a tax on profits from building developments. Philanthropic groups and Trusts, and advertisers, should be encouraged to donate them.
2. THE LAST LANDSCAPE by William H. Whyte; Doubleday Anchor, Garden City, N.Y., 1968, 1970, \$1.95. On preserving open spaces, greenbelts, the designs of nature, and enhancing urban beauty.
3. DESIGN WITH NATURE by Ian McHarg; Natural History Press, Garden City, N.Y., 1969, 1971, \$5.95.

4. GOD'S OWN JUNKYARD: THE PLANNED DETERIORATION OF AMERICA'S LANDSCAPE by Peter Blake; Holt, Rinehart and Winston, N.Y., 1964, \$2.95.
5. LIVING WITH YOUR LAND: A GUIDE TO CONSERVATION FOR THE CITY'S FRINGE by John Vosburgh; Scribners, N.Y., 1968, \$6.95.
6. SMALL URBAN SPACES: THE PHILOSOPHY, DESIGN, SOCIOLOGY AND POLITICS OF VEST-POCKET PARKS AND OTHER SMALL URBAN OPEN SPACE, edited by Whitney North Seymour, Jr., New York University Press, N.Y., 1969, \$7.95.
7. OPEN SPACE COMMUNITIES IN THE MARKETPLACE by Carl Norcross; Urban Land Institute, Washington, D.C., 1966, \$6.
8. THE AFTER-DINNER GARDENING BOOK by Richard W. Langer; Collier, N.Y., 1969, \$1.50.
9. HOUSE PLANTS, Grosset & Dunlap, N.Y., 1972, \$3.95.
10. WINDOW-BOX GARDENING, Macmillan, N.Y., 1956, \$4.95.

Publications

1. OPEN SPACE FOR URBAN AMERICA by Ann Louise Strong; Urban Renewal Administration, Department of Housing and Urban Development, Washington, D.C., 1965.
2. THE GOOD CITY: BUILDING AND PLANNING FOR MODERN MAN by German Federation for Housing, Town and Regional Planning, No. 76, 5 Cologne-Mulheim, Wrangelstrabe 12.
3. HOUSE PLANTS, # 40, Brooklyn Botanical Garden, 1000 Washington Ave., Brooklyn, N.Y. 11225, \$1.
4. GARDENING IN CONTAINERS, # 26, also from Brooklyn Botanical Garden for \$1.

Magazines

1. LANDSCAPE ARCHITECTURE, American Society of Landscape Architects, Schuster Building, 1500 Bardstown Road, Louisville, Ky. 40205.

Articles

1. "Nearly All of Central Park's Trees Suffer From Neglect and Poor Care" by Lee Dembart, THE NEW YORK TIMES, June 4, 1973.

2. "What Would You Do With Say, Staten Island?" by Ian McHarg, NATURAL HISTORY, April 1969. A specific proposal for designing with nature and preserving what green remains in relatively large amounts within New York City.
3. "City of Light: Study Takes a Dim View" by Nan Robertson, THE NEW YORK TIMES, May 21, 1973. A 2,000-page study concludes that Paris now is run for the sole benefit of commercial developers and that the city's cultural dominance is passing to London and other cities.

Films*

1. THE CITY AND ITS REGION, 28 min., b & w, purchase from Sterling Educational Films \$160, produced in 1964. Lewis Mumford talks about the need for compact cities adjacent to countryside and the avoidance of random, formless, semi-urban development. Jr. high school to adult.
2. BULLDOZED AMERICA, 25 min., b & w, purchase from Carousel \$135. A poignant record of what the bulldozer has done to the green. Jr. high school to adult.
3. THE PARK, 7 min., color, purchase from ACI Films \$110, produced in 1972. About nature's oasis within a city. Jr. high school to adult.
4. A PARK ON OUR BLOCK, 20 min., b & w, free loan from Modern Talking Pictures, produced in 1970. A film made for the Department of Housing and Urban Development showing the evolution of a park tailored to community needs in New York City.
5. BUT THE DUTCH MADE HOLLAND, 25 min., color, purchase from Films Inc. \$280, rental \$16, produced in 1970. The most densely populated nation in the world looks like a big garden. Jr. high school to adult.
6. URBAN SPRAWL VS. PLANNED GROWTH, 22 min., color, purchase from Stuart Finley \$200, rental \$15, produced in 1968. Property owners are compensated for refusing to turn over their land for development: a new technique to preserve green space. Jr. high school to adult.
7. OPEN SPACE, 11 min., color, purchase from ACI Films \$150. A plea for immediate reconsideration of land-use policies. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

8. CITIES -- THE RISE OF NEW TOWNS, 60 min., b & w, purchase from Indiana University \$200, rental \$12, produced in 1966. An illustrated discussion of the theme: the city in the country and the country in the city. Adult.

Organizations

1. Regional Plan Association
235 East 45th St.
New York, N.Y. 10017
2. Open Space Institute
145 East 52nd St.
New York, N.Y. 10022
(Publishes material on ways that community leaders can preserve open space.)
3. The Nature Conservancy
Suite 800
1800 North Kent St.
Arlington, Va. 22209
(Buys and preserves desirable green areas from development.)

Government agencies

1. Urban Beautification and Improvement Program
Department of Housing and Urban Development
451 7th Street, S.W.
Washington, D.C. 20410
(Provides grants to assist programs to improve open space.)

LIVING OFF THE LAND



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LIVING OFF THE LAND

Perspective

In Oregon, Governor Tom McCall said in 1971: "Come visit Oregon again and again, but for heaven's sake don't come here to live." Two years later, Governor McCall was hedging on the qualified invitation, recommending a cut in advertising promotion of tourism and voicing the hope that visitors would spread out from the summer months through the year and away from the coastal areas through the state.

In Vermont, the desire for clean country land was so great that some people were buying properties one year and selling the next -- and realizing profits of 100 percent, 200 percent, and more. In California and other states, the combination of rising property taxes and irresistible offers by developers was causing ever greater numbers of farmers to sell agricultural land that had been their life-long occupations to make profits that ensured living the rest of their lives without work or financial worries.

California is the nation's leading agricultural state, but ecologist Kenneth Watt of the University of California, Davis, told Congress in September, 1969, that if present trends continue California will be short of agricultural land by the year 2000. "The really critical thing about the process I am discussing is that each part of the United States is essentially planning to go out of agriculture. If you talk to long-range planners from California or Florida or any other state, you will find that most of the planning is based on the hidden assumption that other parts of the country will supply the necessary food.

"However, if your subcommittee* talks to real estate developers from various parts of the country, you will have great difficulty discovering that part which is volunteering to supply the rest with food. Thus, all parts will run out of food altogether, quite suddenly, and this is another essential finding being brought out by the various groups doing simulation studies on competition for resources. Thus, the two most important features of the catastrophes that will arise from competition for resources are these: First, the fundamental explanation is too many people, linked with an absence of any centrally coordinated nationwide plan for survival, and second, the suddenness with which the catastrophe will appear."

*Watt was speaking at a hearing on "Effects of Population Growth on Natural Resources and the Environment" of a subcommittee of the House Committee on Government Operations, Sept. 15-16, 1969. U.S. Government Printing Office, \$1.

Watt advised the congressmen: "(M)issue of land caused by land speculation is one of the great enemies of organized society, and must be regarded as such. A punitive capital gains tax on speculation in land would insure that enough farmland was left under cultivation so that Americans could eat in the future, and have adequate supplies of timber, pulp for paper, and recreational land."

In April 1973, the state of Vermont enacted an escalating capital gains tax on land that would go as high as 60 percent on properties held for less than 1 year and bringing 200 percent or more profit to the owner. In order to save dwindling agricultural land on Long Island, the Suffolk Executive proposed that the County buy upwards of 12,000 acres of farmland in order to preserve it forever for agriculture and prevent it from being used for developmental housing. For several years, the Congress has been working on a coordinated land-use bill for more rational supervision of the disposition of 755 million acres -- one-third of the nation's real estate -- under Federal control.

Fred Bosselman and David Callies called the new laws and trends The Quiet Revolution in Land Use Control in a report they prepared for the Council on Environmental Quality in 1971. "The ancient regime being overthrown," they wrote, "is the feudal system under which the entire pattern of land development has been controlled by thousands of individual local governments, each seeking to maximize its tax base and minimize its social problems, and caring less what happens to all the others."

"The tools of the revolution are new laws taking a wide variety of forms but each sharing a common theme -- the need to provide some degree of state or regional participation in the major decisions that affect the use of our increasingly limited supply of land..."

On the global scale, the land situation is more serious than it is in the United States. Mainly, this is because overseas farming methods are more primitive and less mechanized, agricultural returns poorer, populations greater, and these populations are growing at a faster rate. Whereas only one person in 20 in the United States is an agricultural worker, every other person in the world works the land. Residents in the high-income countries -- 30 percent of the world's population -- enjoy an average of 3,000 calories a day; people in low-income nations -- 70 percent of the world's population -- get only 2,100 calories a day, or less than adequate subsistence.

Hopefully, the Green Revolution with its greatly increased yields in wheat and rice will improve the food intake for Asian and other poor nations. But new methods of agriculture bring other problems, such as pesticide pollution, high costs for irrigation, and great rewards for wealthy land owners while tending to drive small farmers from their plots of land to glut the cities. But, most of all, these developing nations face the seemingly inexorable prospect of having their agricultural gains globbled up by bumper crops of babies.

Only about 2 percent of the Earth's surface is planted to food crops. About 7 or 8 percent is forested, 6 percent is grasslands, 5 percent desert -- the rest water and ice. Right now, there is about four-fifths of an acre of crop land per person in the world. But the ratio is dropping by the year because of soil erosion, strip mining, paving, and, most of all, because of the tremendous growth in human population. By the year 2000, it is estimated that the world will have only one-fourth as much arable land per capita as we had a century ago.

New agricultural technologies, new land practices and planned coordinated land-use obviously will be forced into being. Rising prices of meat, other food, and land in the United States indicate that even the most fortunate nations are not free of population-land pressures. The broadcast documents steps being taken in less fortunate nations.

The broadcast: LIVING OFF THE LAND

If the theme of this broadcast were to be summed up in a single statement, it would be to show the importance of planning for environmental impact along with planning for development. The theme is illustrated through problems and practices in two contrasting African nations: progressive Ghana toward the northwest and primitive Malawi to the southeast.

Malawi has no industrial pollution; it has no industry. Ninety-six percent of the people in this landlocked country are agrarian with a tradition of living off subsistence farming. Malawi does have environmental problems that must be and are beginning to be dealt with. Malawi is one of the most densely populated nations in the world with some 300 to 500 people per square mile. The rate of population growth is 3 percent a year, which means that the population will double in little more than a quarter of a century, and so, there will be commensurately less arable land per person.

So, for one thing, these people who know only one method of survival, to live off the land, are running out of land. Most of the arable land now is planted -- to the tops of the hills. Traditionally, they had been nomadic farmers -- that is, each family or group would farm a patch of land intensively for several years until it became depleted and then move on to more fertile areas. The country and its people no longer can afford this wasteful practice. For the first time, land is being registered. Farmers are being taught how to take care of their own farmland. They learn contour planting in hilly terrain. They learn crop rotation -- peanuts, tobacco, maize -- to allow the soil to renew itself. They are shown how to build diversion ditches to protect against the insidious soil erosion that has been robbing the country of its topsoil.

Farmers are being taught how to develop cash crops. Some of these farmers have increased their productivity 8 times, so that crops such as corn and tobacco can be marketed in neighboring states. This has been accomplished without mechanization, deliberately so. The only mechanized equipment used are bulldozers, to clear roads so that the crops can be brought to market by ox cart. Mechanization in farming is avoided because it would simply drive agricultural workers from the national occupation into the one established urban center that already is overcrowded. In order to procure the land and hand tools, farmers borrow money from the government. Their repayment record is the highest in Africa -- 99 percent.

Mothers must be educated to basic child care, to the uses of gardening and to including green vegetables in their children's diet in order to overcome malnutrition. Men must be educated to use new wells bored down 120 feet to tap clean, fresh water, and educated to forsake the old bore holes that for so long have given them access to muddy and unsanitary water 6 feet down. Cattle must be raised and grazed in an important watershed area in order to keep farmers from moving in to plow the land and to cause erosion which would destroy an irreplaceable water supply. The animals are fed vegetable residues so that there is very little agricultural waste.

In these various ways, Malawi is making a transition to a new existence, managing to provide the food and means of subsistence for its people, and to export some crops for a cash return.

Ghana took a giant step into the 20th century by damming the Volta River and creating 250-mile-long Lake Volta, the greatest man-made lake in the world. Nearly one-fifth of the country now is under water. Ghanians expected benefits, but there have been drawbacks as well. Among the benefits was the creation of so much electric power that Ghana now can export some of that energy. With that power, Ghana could exploit its liberal bauxite deposits, operating a smelter plant to produce aluminum, another cash export where once only cocoa had been the nation's sole cash crop. Fish populations exploded in the new lake and so did the size of individual fishes. In the first

three years, 65,000 tons of fish were taken from the new lake - still another new industry came into being. So far, the lake has not been overwhelmed with algae and other noxious plant life -- phenomena which reduced fish production in the lakes formed by other dams in Africa -- Nasser in Egypt and Kariba in Rhodesia.

There was still another, serendipitous benefit. A lake shore of 3,500 miles was created. Eight months of the year, a rim of this shoreline is exposed by the lowering of the lake level because of natural water loss and by the opening of spillways. The other 4 months, this stratum of lake edge is under water. With the supervision of the U.N. Food and Agriculture Organization, Ghanians have been experimenting with an entirely new agricultural venture -- planting tomatoes and other crops on the enriched lakefront land when it is above water. The future promise of this enterprise at the moment is threatened by the appearance of fast-growing weeds and the gradual mixing of sand from the lake waters with the rich soil.

There have been other, more serious problems. For one thing, the tremendous dislocation of people. More than 700 villages were inundated by Lake Volta. More than 80,000 people had to be relocated. Fifty-two new villages were built. The government provided each family with the materials to build a nuclear house to help ease the resettlement. Still, happiness is far from universal with the new arrangement. The government had hoped that resettled fishermen would become farmers in their new surroundings. But many of these people return to become fishermen in the lake.

And the lake itself -- with its still waters in contrast to the moving currents of the former river -- has become a receptacle for disease, particularly the debilitating schistosomiasis. This disease is caused by an organism which spends part of its life cycle in snails and part in humans. The organism penetrates the skin to gain entry into the human host, but goes back into the water when the humans use the lake for their toilet. Water-borne diseases (malaria is spread by mosquitoes that breed in stagnant waters) sap the vitality of a people; they deprive the country of the full advantages proffered by the arrival of new technology.

Ghana is trying to combat these diseases, and to discriminate between the environmentally good and bad.

There is good reason for people in industrialized societies to be concerned with the environmental problems of the underdeveloped countries, for it is important that these nations, as they develop, are not beset by the pollution and natural deterioration that has penalized the developed countries. As we well know, environmental contamination does not remain within national boundaries.

What can I do?

You and/or many of your fellow citizens already have taken significant action toward planning the prudent use of land -- by supporting and encouraging lawmakers on Federal and state levels who have enacted the environmental protection legislation of the past several years.

For example, the National Environmental Policy Act requires that governmental agencies must assess beforehand the impact of proposed actions upon the environment. If there is a less environmentally damaging way to carry out a proposal, then they must do it that way. They must strive for the least, or no, adverse environmental impact. These requirements are consistent with the proper use of land; almost by indirection, they encourage and coerce officials to use land in an environmentally conservative way.

Another example in indirection: the Clean Air Act of 1970. This law says that states are not permitted to taint or reduce the quality of air that is clean. In order to live up to this law, the Federal Environmental Protection Agency has told the states, they will in effect have to plan the use of land beforehand. They will not, for instance, be able to site power plants indiscriminately, but will have to weigh carefully such a plant's output of air pollution, and they figure which zone's within a state are legally allowed to absorb such an increment of contamination.

The Adirondack Park Land Use and Development Plan, passed by the New York State Legislature in 1973, is a fine example of direct land use programming and can serve as a model for the philosophy that is emerging in the United States because of the growing intensive and multiple demands upon land. The mountainous, forested Adirondack area in upstate New York that now will be administered by the Adirondack Park Agency and local governments comprises about one-sixth of the area of the entire state -- some 8,700 square miles. Not quite 40 percent of this land is state-owned and virtually all of that is protected by a "forever wild" clause in the State constitution.

Now, the other 60-plus percent of privately owned land will be subject to careful rules and guidelines as to how it is developed. These land use areas (which are interspersed with the "forever wild" ones) are divided into six types, with, in general, an increasing stringency in the kinds of impact permitted: Industrial Use Areas, Hamlet Areas, Moderate Intensity Use Areas, Low Intensity Use Areas, Rural Use Areas, and Resource Management Areas. Before any substantial development is permitted, its potential impact upon the park's natural, scenic, aesthetic, ecological, wildlife, historic, recreational or open space resources will be considered. Natural resource considerations will include all aspects of water and land quality, air quality, noise, critical natural resources of overall value to the State, wildlife, aesthetics, historic sites. Development of lake and waterway shorelines is restricted: minimums

are set for shoreline lot widths, all buildings must be set back from the shoreline and so must sewage facilities.

The underlying purpose of the Adirondack Park Plan is to insure the optimum conservation, protection, preservation, development, and use of the unique scenic, ecological, and natural resources therein, and, at the same time, to focus the responsibility for developing long-range park policy in a forum reflecting statewide concern, while providing a continuing role for local government.

Now, New York State's Department of Environmental Conservation has published a preliminary plan to regulate development statewide in such a way that environmental quality is preserved. In a significant exposition of the emergent new land philosophy, the report states: "Traditionally, a land owner has the right to do as he wishes with his land, but with rising population, urban expansion, increasing mobility and new understanding of the impact of our actions on others, land management must be carried out with respect for public as well as private good." (See Publications in following section.)

One implication of this philosophy is the recognition of land speculation and land speculators for what they are: enemies of society. Not objects of admiration, envy, and imitation, but objects of scorn and contempt. 'Speculators' distorted regard for land only as an economic commodity, as a means for a "fast buck", accelerates the environmental degradation of our country. Either we or our posterity must pay the bill for restoring the quality of our land.

You can act positively on this by supporting officials and lawmakers -- and everyone else -- who advocate proper land use and planning, thereby preventing the misuse and abuse of land. (See SCARS ON THE SURFACE.)

Recognize that even without vicious practices, we are enmeshed in a process that is escalating the demand for space: our growing technologies, growing desires (for recreation, a second home, and all the rest), and growing population. In so many of the environmental areas the problems get back to the increase in human numbers and the need to control their growth. (See AMONG THE LIVING).

Support leaders who advocate and effect large-scale planning for proper land-use: only the good-will and cooperative action of society as a whole can have the force to curb excesses, and to cool the temptations of the individual. Press for national planning for food production lands.

Embrace the ecological overview that land is more than a supply depot, more than a field of beans, more than a layout for a golf course, more than money in another form. It is the oikos, our home what shapes us emotionally and spiritually. Consider the land ethic of ecologist Aldo Leopold:

"There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slave-girls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations. The extension of ethics to this third element" (following ethical relations toward individuals and society) "in human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity."

Further on in "The Land Ethic," Leopold writes: "One basic weakness in a conservation system based wholly on economic motives is that most members of the land community have no economic value. Wildflowers and songbirds are examples. Of the 22,000 higher plants and animals native to Wisconsin, it is doubtful whether more than 5 percent can be sold, fed, eaten, or otherwise put to economic use. Yet these creatures are members of the biotic community, and if (as I believe) its stability depends on its integrity, they are entitled to continuance."

And still later: "A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of land for self-renewal. Conservation is our effort to understand and preserve this capacity."

Aldo Leopold wrote those words before his death in 1948. Now, a generation later, his ethics seem more natural and necessary.

For further information

Books

1. THE USE OF LAND: A CITIZEN'S POLICY GUIDE TO URBAN GROWTH, Crowell, N.Y., 1973, \$10, ppbk \$3.95. Report of a task force on land use and urban growth which Environmental Quality Control Council chairman Russell Train calls "seminal."
2. THE LAST LANDSCAPE by William H. Whyte; Doubleday Anchor, Garden City, N.Y., 1968, 1970, \$1.95.
3. A SAND COUNTY ALMANAC, including "The Land Ethic," by Aldo Leopold; Oxford, N.Y., 1966, \$6.50.
4. THE LAND SYSTEM FOR THE UNITED STATES: AN INTRODUCTION TO THE HISTORY AND PRACTICES OF LAND USE AND LAND TENURE by Marion Clawson; U. of Nebraska Press, Lincoln, 1968, \$3.75.
5. THE QUIET CRISIS by Stewart Udall; Avon, N.Y., 1963, 1964, 95 cents. The disturbing account of the evolution of attitudes toward land from the native American Indians to contemporary commercial American society.

6. FARMS AND FARMERS IN AN URBAN AGE by Edward Higbee; The Twentieth Century Fund, N.Y., 1963, \$1.45. An eye-opener, written relatively early, on what has happened to farming in industrial society.
7. WORLD WITHOUT BORDERS by Lester Brown; Random House, N.Y., 1972, \$8.95. A world view of the impact of development upon environment, and policies to mitigate that impact, by a recognized authority on the subject.
8. SEEDS OF CHANGE: THE GREEN REVOLUTION AND DEVELOPMENT IN THE 1970's by Lester Brown; Praeger, N.Y., 1970, \$6.95. This is a brief that the need for the benefits of the Green Revolution outweigh environmental and social hazards; but the book cultivates awareness of the relationship between development and environmental boundaries.
9. ONLY ONE EARTH by Barbara Ward and Rene Dubos; Norton, N.Y., 1972, \$6. An unofficial report commissioned by the Secretary-General of the United Nations for the Stockholm Conference, prepared with the assistance of a 152-member committee of corresponding consultants in 58 countries and dealing with such subjects as use and abuse of land, development, and other related areas.
10. THE DILIGENT DESTROYERS by George Laycock, Doubleday, Garden City, N.Y., 1970, \$5.95. About the Army Corps of Engineers.
11. THE CARELESS TECHNOLOGY: ECOLOGY AND INTERNATIONAL DEVELOPMENT, edited by M. Taghi Farvar and John P. Milton; Natural History Press, N.Y., 1972, \$25. This huge volume (1030 pages) is based on a "Conference on the Ecological Aspect of International Development" sponsored by the Center for the Biology of Natural Systems, Washington U. in St. Louis, and Office of International Affairs of The Conservation Foundation.
12. NIGHT COMES TO THE CUMBERLANDS: A BIOGRAPHY OF A DEPRESSED AREA by Harry M. Caudill; Little, Brown, Boston, 1963, \$2.45. A case study of what happens to land exploited by absentee owners.
13. EUTROPHICATION IN LARGE LAKES AND IMPOUNDMENTS, a report of a symposium held in Uppsala, Sweden, in May, 1968, by water management experts of the Organization for Economic Cooperation and Development, edited by C. P. Milway, OECD Publications, Paris, 1970.

14. VOLTA: MAN'S GREATEST LAKE by James Moxon; Praeger, N.Y., 1969, \$7.50. The definitive book on the creation of the lake by damming the Volta River in Ghana.
15. THE VOLTA RESETTLEMENT EXPERIENCE edited by Robert Chambers; Praeger, N.Y., 1970, \$7. The companion study of the Lake Volta experiment -- the report on the resettlement of more than 80,000 people.

Publications

1. MAN-MADE LAKES: PLANNING AND DEVELOPMENT, edited by Earl Lagler, U.N. Development Programme and the Food and Agriculture Organization, Rome, 1969. A useful accounting of problems as well as benefits associated with dams and man-made lakes. Its philosophy is summed up in a cover caption: "Dams can raise more problems than they solve. Human and other natural resource problems created by dams will not go away if they are ignored: they can, however, be minimized or solved advantageously when early thinking produces timely and sound action."
2. MAN-MADE LAKES AS MODIFIED ECOSYSTEMS by the SCOPE (Scientific Committee on Problems of the Environment) Working Group on Man-Made Lakes in Paris, 1972. SCOPE is a unit of the International Council of Scientific Unions.
3. COMMENTS ON A BRIEF RECONNAISSANCE OF RESOURCE USE, PROGRESS AND CONSERVATION NEEDS IN SOME LATIN AMERICAN COUNTRIES by William Vogt, 1963 with a second printing in 1967, sponsored and published by The Conservation Foundation, Washington, D.C. This is a relatively early, but sensitive report and a model of its kind.
4. ENVIRONMENTAL PLAN FOR NEW YORK STATE, a 91-page preliminary plan to guide the development of the State without endangering its land, air, or water. "Traditionally, a land owner has the right to do as he wishes with this land," the report says, "but with rising population, urban expansion, increasing mobility and new understanding of the impact of our actions on others, land management must be carried out with respect for public as well as private good." A copy of the report may be obtained from Environmental Plan, Department of Environmental Conservation, 50 Wolf Road, Albany, N.Y. 12201.

Magazines

1. OUR PUBLIC LANDS, a quarterly published by the Bureau of Land Management, Department of the Interior, 18th and C Sts., N.W., Washington, D.C. 20240.

2. LAND ECONOMICS, Journals Department 129, University of Wisconsin Press, Box 1379, Madison, Wisc. 53701, Quarterly, \$8.
3. URBAN LAND: News and Trends in Land Development, Urban Land Institute, 1200 18th St., NW, Washington, D.C. 20036, \$8.
4. LANDSCAPE ARCHITECTURE, American Society of Landscape Architects, Schuster Building, 1500 Bardstown Road, Louisville, Ky. 40205, Quarterly, \$8.50.

Articles

1. "Land Use Control: Rockefeller Task Force Calls for Boldness;" SCIENCE, June 8, 1973. The report calls for "agricultural, natural areas or floodplain zoning" among other measures to preserve open space.
2. "The Federal Government Moves to Strengthen the Hand of the States in Meeting a Major Unmet Environmental Challenge: Land-Use Control," CF LETTER, Aug., 1972, The Conservation Foundation.
3. "Some Important Decisions on the Future of the Nation's Public Lands Are Pending," CF LETTER, March, 1971, The Conservation Foundation.
4. "Revised Policy For U.S. Lands Asked in Study" by Gladwin Hill, THE NEW YORK TIMES, June 24, 1970. The report of the Public Land Law Review Commission.
5. "Focus on Public Land" by Gladwin Hill, THE NEW YORK TIMES, June 25, 1970. An analysis.
6. "Governor McCall Seeks to Curb Oregon's Growth" by David Bird, THE NEW YORK TIMES, May 7, 1973.
7. "Vermont Gets Tough on Land Sales" by William Connolly, THE NEW YORK TIMES, May 27, 1973.
8. "Suffolk Plans to Buy and Protect Farms," by David Andelman, THE NEW YORK TIMES, Jan. 3, 1973.
9. "Sierra Club Bids U.S. Keep Public Land" by Anthony Ripley, THE NEW YORK TIMES, Feb. 15, 1971.

Films*

1. MUD, 20 min., color, purchase from Stuart Finley \$225; no charge for loan from Interstate Commission on Potomac River Basin, 1025 Vermont Ave. NW, Washington, DC 20005. A film about urban erosion and sedimentation and what can be done about them.
2. LITTLE BIG LAND, 30 min., color, purchase from Indiana University \$315, rental \$11.50. Produced by WTTW, Chicago for Public Broadcasting, it discusses the rapid consumption of land and what can be done about it.
3. SODBUSTERS, 30 min., color, purchase from Indiana University \$315, rental \$11.50. Produced by WTTW, Chicago, the film discusses our attitudes toward and relationship with land.
4. BULLDOZED AMERICA, 25 min., b & w, purchase from Carousel Films \$135. Documents the destruction of natural beauty at the altar of development.
5. CASH REGISTER IN THE ROCKIES, 14 min., color, purchase from NBC \$180, rental \$10, produced in 1971. The story of owners selling land at prices too high to resist for enterprises which degrade the land. Jr. high school to adult.
6. DUST BOWL, 26 min., b & w, purchase from Contemporary \$160, rental \$14, produced in 1960 by CBS News-20th Century. The story of the southwestern plains turned to powder by overgrazing and overcultivating. Jr. high school to adult.
7. MULTIPLY...AND SUBDUE THE EARTH, 67 min., color and b & w, purchase from Indiana U. \$450 for color, \$270 for b & w; rental \$18.50 for color, \$13.50 for b & w, produced in 1969 for Public Broadcasting Laboratory. Film illustrates philosophy of ecological landscape designer Ian McHarg.
8. HOW GERING VALLEY SAVED ITSELF FROM DISASTER, 25½ min., color, purchase from Portland Cement Association \$180.77, rental \$5, produced in 1967. An informative account of how a large valley in Nebraska, rendered almost useless by mismanagement, erosion, and flood, was saved by an intergovernmental program employing contour terracing, dams, canals, conduits, dikes. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

9. EROSION, 10½ min., color, purchase from BFA Educational Media \$125, rental \$6.50. An account of what erosion is, for grades 4 through Jr. high school.
10. MAN MAKES A DESERT, 10½ min., color and b & w, purchase from BFA Educational Media \$120 for color, \$60 for b & w; rental \$6.50 for color or b & w, produced in 1964. How, through greed and ignorance, overgrazing and over-cultivating turned a rich pastureland into a desert. Filmed in Southwest. Jr. high school to adult.
11. BUT THE DUTCH MADE HOLLAND, 25 min., color, purchase from Films Inc. \$280, rental \$16, produced in 1970. This film shows what the Dutch have done with the little land they started with plus what they wrested from the sea. Jr. high school to adult.
12. THE CITY AND ITS REGION, 28 min., b & w, purchase from Sterling Educational Films \$160, produced in 1964. Lewis Mumford talks about the need for compact cities adjacent to countryside and the avoidance of random, formless, semi-urban development. Jr. high school to adult.
13. BREAKING THE WEB, 11 min., color, purchase from Pictura Films \$100, rental \$10, produced in 1968. The film shows the dangers from upsetting the natural balance by such practices as draining marshes for real estate development in Florida and clearcutting trees in Georgia. Jr. high school to adult.
14. THE DAM BUILDERS, 30 min., color, purchase from Contemporary Films \$350, rental \$18. The story of Kariba Dam in Rhodesia, its success in producing power and its ecological failures. Jr. high school to adult.
15. VISIT TO A SMALL VILLAGE, 12 min., color, purchase from Association-Sterling Films \$144, rental \$10. A successful effort in Ghana to stem the migration of people from a small village, which had begun to die, to a city, which already was choking with people. Jr. high school to adult.
16. THE TREEHOUSE, 9 min., color, purchase from Holt, Rinehart and Winston, \$140, rental \$15, produced in 1970. The story of a boy who must give up his tree house to the bulldozer. Jr. high school to adult.

Organizations

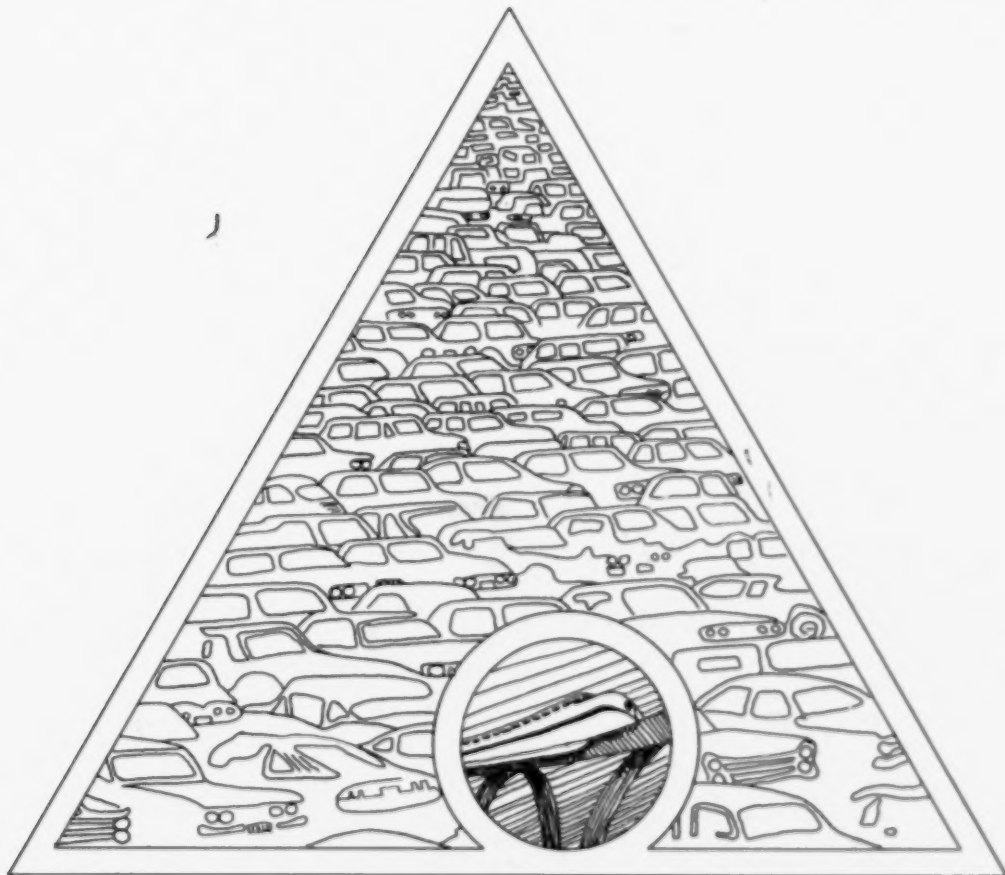
1. Planned Parenthood-World Population
810 Seventh Ave.
New York, N.Y. 10019
2. American Institute of Planners
917 15th St. NW
Room 800
Washington, D.C. 20005
(Professionals either in or out of government engaged
in comprehensive planning.)
3. American Society of Planning Officials
1313 East 60th St.
Chicago, Ill. 60637
(To foster best techniques and decisions for planned
development of communities and regions.)
4. American Society of Landscape Architects
2013 Eye St., NW
Washington, D.C. 20006

Government Agencies

1. Committee on Interior and Insular Affairs
Room 1324
Longworth House Office Building
Washington, D.C. 20510
2. Committee on Interior and Insular Affairs
Room 3106
New Senate Office Building
Washington, D.C. 20510
3. United Nations Development Programme
833 United Nations Plaza
New York, N.Y. 10017
4. Bureau of Land Management
U.S. Department of the Interior
C St. between 18th and 19th, NW
Washington, D.C. 20240
(The Bureau administers public domain lands which
constitute about 60 percent of federally owned lands;
they are managed for multiple uses, including recreation,
fish and wildlife production, livestock grazing, timber,
industrial development, watershed protection, and
mineral production.)

5. Food and Agriculture Organization
Via delle Terme di Caracalla-00100
Rome, Italy
6. Committee on Agriculture
Room 1301
Longworth House Office Building
Washington, D.C. 20515
7. U.S. Department of Agriculture
14th St. and Jefferson Dr., SW
Washington, D.C. 20250
(And Extension Service in individual states, Forest
Service, Soil Conservation Service.)
8. Committee on Agriculture and Forestry
Room 324
Old Senate Office Building
Washington, D.C. 20510

TRAFFIC OR TRANSIT



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TRAFFIC OR TRANSIT

Perspective

During 1948, the New York subway system -- the biggest in the world -- carried more than 2 billion passengers. But, during that year, also, a crucial event took place. Such an event, and those in other mass transit systems, helped introduce a cycle that has gone on for a generation with even greater ramifications and deleterious effects upon contemporary life. The event was a fare increase. The cost of a subway ride had always been a nickel since the system began at the turn of the century; in 1948, it went to a dime. In 1949, the subways lost 270 million riders.

The attrition continued over the next 4 years until, by 1953, the decimation had reached 25 percent -- 5 years after the fare raise, the subways were carrying half a billion fewer passengers. This meant that, despite doubling the fare, the mass transit system once again was in financial trouble. The only solution that occurred to anyone was for riders to ante up the fare another nickel. It was strong medicine: this time the 1-year loss was nearly 10 percent of the remaining and what might be called the harder core straphangers. This large-scale drop-off again was followed by more moderate desertions, finally adding up to a sufficient loss of passengers to require another dose of the familiar nostrum, a fare increase to 20 cents, followed by another whopping loss of riders. And so the vicious cycle goes on with everyone, like the Bourbons, grimly determined to learn nothing from what has transpired. In 1970, fewer than half as many Americans were conveyed by public transit as in 1950.

There were other feedback loops to the vicious cycle. The former subway riders continued to and from their jobs in Manhattan, of course, but chose the privacy and preferable environments of their automobiles to do so. This meant that New York City became overloaded with automobiles, the unhappy scenes of street congestion and rush-hour traffic. And this meant a palpable deterioration of city air since, as we are well aware today, the auto is the major culprit in urban air pollution. Edwin Marston, a physicist at Ramapo College in the New Jersey State University system, calculated that when the New York subway fare went from 15 to 20 cents, New York City air gained an additional 20 million pounds of pollution (the calculations based on the 60 million mass transit riders who switched to automobiles). This was 1966 and, by this time, air pollution was recognized as an enemy of the people. The same political leaders who consented to the subway fare increase solemnly proclaimed their opposition to air pollution, but no one noticed an inconsistency between the proclamations and the actions.

Marsten, whose specialty is the physics of urban systems, was an exception. Further, he noted other aspects of the vicious cycle. The automobile began claiming an ever larger part of New York City and today assumes sovereignty over one quarter or more of Manhattan's expensive real estate. In order to accommodate the riders who had abandoned the subways for their autos, governmental authorities improved and enlarged the arterial road system feeding into the city. But this development not only helped people get into the city, it helped city people get out. It was during the 1950's and 1960's that the great exodus from the inner city to the suburbs took place -- city dwellers fleeing the deteriorating air, rising noise levels, tension and traffic congestion, and increasingly dehumanized ambience. The dispersion of the population led to further reliance on the auto-highway transport system, accelerating traffic-environmental problems.

The reasons are quite plain to physicist Marston. Great numbers of travelers had transferred from the most efficient to the least efficient means of moving people in an urban area. A train can transport 60,000 people an hour over a single lane of track; autos can move only 3,000 people over a comparable lane of highway. Not only does the auto-highway system require up to 50 times as much land as the train, but it required 10 times as much energy to move the same number of riders. Consumption of energy means release of waste heat. During the 1950's and 1960's, New Yorkers who remained in the city resorted to air conditioners to counter the rising air, thermal, and noise pollutions outside. But, Marston points out, this was a self-defeating solution, worsening the situation, because air conditioners generate more heat than they remove. Not only that, but they demand enormous amounts of electricity. Con Edison was forced to provide more electricity (and even then could no longer meet summer peak demands), thus adding to the load of air and thermal pollution. When air conditioning was added to autos to insulate the occupants to an increasingly hostile highway environment, another increment was added to thermal waste. Each increment of environmental deterioration spurs X number of city occupants to jump into their cars to get out to the country and beaches, if just for a few hours, thus adding X more autos to the flow and thus adding...

If the self-feeding cycle perceived by Marston could be reversed; if public transit became more effective and attractive; if more and more people began switching back to mass transportation; if the increased volume of riders swelled coffers so that fares could be reduced and facilities further improved, attracting still more passengers, bringing in still more money, enabling still further improvements and fare reductions; if the

resulting cuts in air and thermal and noise pollutions and the easing of the energy drain enhanced the urban environment so that urbanites were not impelled to flee the inner city - who knows where that kind of cycle would end?

The United States is, by far, the most heavily committed nation on Earth to the auto highway system, with more than 100 million passenger cars and commercial vehicles for the more than 200 million people, roughly one vehicle for every other American. This fact has certain practical implications which must be recognized. More than 15 percent of our population -- about one person in six -- is dependent for its livelihood on the automobile system. Governments, particularly at the Federal and state levels, receive a disproportionate amount of their revenues from auto taxes and tolls. The proliferation of roads and autos, thus leading to new communities, have been good for the spread of business. The automobile has given a large majority of Americans a freedom of movement, and thus a new dimension to their lives, unmatched by any society in history; for many years, owning a car has been an important part of the American dream. At the same time, rails and all other means of public transport except for airplane travel were relegated to social inferiority, followed by physical decrepitude.

The result of these reinforcing factors was the powerful ascendancy of auto-highway-oil interests in American life with a concomitant political clout. The result of this domination has been a reluctance to tolerate alternative methods of transportation -- even though the threats to the welfare of ever greater numbers of Americans became more apparent. But the signs of change, despite this powerful resistance, are visible. Perhaps nothing symbolizes the change better than the determination of a new mayor to build a public transit system in Los Angeles, the city wedded to the automobile. And when in 1973 William Ronan of the Metropolitan Transportation Authority warned that New York subway fares might rocket to 60 cents, the most important challenge came from New York City's Environmental Protection Administrator: he said that the increased air pollution resulting from such a fare hike would make the move illegal under both the Clean Air Act and the National Environmental Policy Act. As a third instance, the high-speed Metroliner between New York and Washington was demonstrating a viable rail alternative to the auto-highway system and short-haul air travel (high speed intercity trains in Japan have proved to be exceedingly popular and significant financial successes).

But, not unsurprisingly, most of the experimenting and applications of new ways to move more people better and faster are taking place in industrial nations not so fully committed to and dominated by auto systems.

The broadcast, TRAFFIC OR TRANSIT, explored some of these alternatives.

The broadcast: TRAFFIC OR TRANSIT

The broadcast begins with the all-too-familiar scene of traffic, traffic everywhere -- autos stalled in street jams, parked in lots, herding over expressways. The environmental mischief of the automobile is recounted: air pollution, monopolizing so much urban space, exhaust damage to building facades, a general and widespread lowering of the living ambience. In industrialized societies, but in the United States particularly, the auto is king.

But there do appear to be some alternatives now on the horizon: some innovative challenges from the field of mass transit and some new ideas in ways to travel. France has been experimenting since 1969 with its Aerotrain, an 80-passenger vehicle which can move at speeds exceeding 180 miles an hour on a cushion of air over a tracked course. A commercial tracked air cushion system is expected to be operating between Paris and a suburb 14 miles away in 1975.

At Morgantown, West Virginia, and on the sprawling campus of West Virginia University, "people movers" are being tested in a program sponsored by the Urban Mass Transportation Administration of the Department of Transportation. These small vehicles, operating on two rail tracks and powered by electricity, may eventually help to reduce the number of autos in central cities.

Other transport systems examined: Hovercraft - boats that travel over water on a cushion of air, and might be useful in easing downtown traffic in urban centers adjacent to bodies of water; electric buses for city transport, to reduce air pollution; electric mini-cars for city driving; and San Francisco's Bay Area Rapid Transit system - perhaps its most novel aspect is that it got built at all - it is the first new rapid transit system built in the United States in 70 years, and its cost exceeds \$1 billion.

In November 1972, Ontario's Premier William Davis proposed a \$1.3 billion program to bring the world's most modern rapid transit system to Toronto and the smaller cities of Ottawa and Hamilton. In June of 1971, Premier Davis brought to a dramatic halt an auto expressway that was designed to alleviate Toronto's transportation problems. The new mass transit system program was his substitute and a dramatic affirmation of one government's faith in the public transit solution to today's travel-traffic problems.

Ideally, Mr. Davis might have preferred to add to and improve Toronto's existing subway system because subways are so efficient. However, subways cost from \$25 million to \$30 million a mile to build, the Toronto planners estimated, and that price might escalate to \$40 million dollars a mile in the next decade before they were finished with the project. So, Premier Davis settled for a system that couldn't move the volume

of people that the subway could, but would not be so expensive -- an elevated and automated system of train-cars that move over tracks separated from them by a cushion of air or held aloft by magnetic repulsion and powered by low-polluting electricity. The elevated system will be built along present rail or other main arteries so that there will be little urban dislocation. To encourage further the use of public transit, Toronto will inaugurate a dial-a-bus system whereby public vehicles convey passengers from portal to portal. When the entire transport complex is completed in 1982, Toronto expects to boast of the most modern mass transit system in the world. The new trains will be silent, virtually nonpolluting of city air, and they will travel at speeds up to 95 miles an hour.

Hamburg, West Germany made do with what it had -- a hodge-podge of public transportation lines -- and converted them into a model for inspection and admiration by transport officials from all over the world. Before December 1966, Hamburg was served by eight competing transport companies, many going to virtually the same places and most of them losing money. During the same 30 years until 1966, the population of Hamburg proper remained almost static, but the population of the surrounding suburbs more than doubled -- a situation comparable to many American counterparts. In ever greater numbers, the commuters deserted the public transit systems for their cars in order to get to and from work. The traffic jams grew longer, the rush hour congestion became chronic. Hamburg was strangulating.

The solution, the city fathers decided, was to modernize and enlarge the one urban train line and integrate it and all the other bus, subway, street car, and ferry lines into one coordinated transportation system. It took 6 years for the concept to be put into operation. The system now serves 2.5 million people in Hamburg and 233 surrounding communities in 1,000 square miles. Bus lines are linked to rail terminals or subway stations and the timetables are coordinated to expedite the traveler. Passengers buy a single ticket for any and all lines (free transfers). There are no ticket-takers or turnstiles; it is an honor system, although riders can be spot-checked by inspectors.

The Hamburg solution is contemporary proof that public patronage of mass transit can be restored. In 1969, the system's third year of operation, when most other urban transport systems in West Germany were losing up to 10 percent of their passenger traffic, the number of Hamburg's passengers was up 3 percent. And this increase despite the fact that there were 23,000 more autos in Hamburg than there were the year before! Today, public passenger traffic has increased by 20 percent since the integrated system began, and Hamburg's automobile traffic has declined noticeably.

What can I do?

It is important to emphasize two sequels to the automobile-as-part-of-the-American-dream syndrome. One is the law of density dependence: as more and more Americans share in the dream, as more citizens own cars, the greater are the restrictions on the freedom of travel for all, the less pleasurable the experience of driving, and the greater the environmental degradation. Total sharing of the dream by all means an intolerable situation -- a nightmare -- for all. Secondly, this American dream concept disenfranchises segments of our society, particularly the poor and the aged, who not only may be prevented from operating an auto because of enfeeblement or some physical impairment but frequently are reduced to straitened economic circumstances. These people are doubly penalized when there is no comparable public transit.

You can adopt a more audacious attitude toward the infringements of the auto system upon our lives. Arise, urban dwellers, counsels Charles Little of The Conservation Foundation, and reclaim what is rightfully yours. "That there has been little or no leadership in an effort to reclaim the city street from the noxious automobile is not to say that such activity can't take place under the auspices of the people themselves. Streets are commonly cordoned off for block parties and bazaars, some of them lasting all summer. In the winter, school streets are closed to traffic for the greater part of the daylight hours, Monday through Friday. And, here and there, a few streets have been permanently closed. I am not talking about the downtown malls popping up in various cities to serve tourism, mercantile interests, or office workers, but rather residential streets in low and middle income neighborhoods.

"Should such streets be returned to a state of nature? Should they have paved sitting areas and locust trees? Should they sport little specialty shops in the brownstone fronts? Should automotive traffic be banned altogether? ...The real determinant is the life-style of the people living along such streets, for it is their open space, after all."

Little by little, auto traffic is being kept out of Central Park in New York City. First it was banned on weekends, then certain week nights, then weekdays between rush hours. Perhaps this recapturing of Central Park foreshadows future urban insurgency against the tyranny of the automobile in the kind of relationship the playing fields of Eton has to Waterloo. (Florence, cradle of the Renaissance and one of the world's premier cities, has banned autos from downtown sections.)

Another kind of action citizens can take -- and are taking -- is to express their strong desires for improved public transit. A recent poll by the Regional Plan Association showed that more than 90 percent of the respondents in the New York-New Jersey-Connecticut metropolitan region favor more reliance on public transportation. Such sentiments must be expressed repeatedly, steadfastly, and loudly in order to get the message through to lawmakers whose attention is commanded by lobbyists for the Highway Trust Fund, the automotive and oil industries. Perhaps the most heartening aspect of the Ecological Revolution is that an informed, vocal, and determined citizenry -- society's legitimate rulers -- can prevail over the invisible constituency of special interests. It is a lesson which must be reaffirmed over and over, for each generation: democracy does work.

Citizen groups can evaluate the public transportation systems in their communities. Why do so many people dislike to use their public transit, and what can be done to eliminate some of these complaints? Some of the objections concern how a few antisocial people behave on buses or subways -- how can this problem be met?

Why should oil companies be the beneficiaries of the gasoline shortage through elimination of independent competitors, elevated prices, fewer gas station outlets, and constricted hours for stations still operating (the latter two items, of course, translating into an appreciable reduction of costs for oil companies)? The gas shortage crisis is a made-to-order fork in the road for a mass return to public transportation...and the conservation of gasoline.

Does your state Public Service Commission really care about public service? Attend hearings on public transportation and find out. Let the commissioners know how you feel. Your point of view could broaden their field of vision.

For other things you can do, see THE CAR IN THE CITY and the What can I do? section of SIX FATHOMS DEEP.

For further information

Books

1. THE GREAT AMERICAN MOTION SICKNESS or WHY YOU CAN'T GET THERE FROM HERE by John Burby; Little, Brown, Boston, 1971, \$8.95. Throwing light on the secrecy of transportation politics.

2. THE PAVERS AND THE PAVED by Ben Kelley; Donald W. Brown, N.Y., 1971, \$5.95. A profile on the highway lobby including a chapter on the legal and politican knowledge and ways useful in (a chapter entitled) "How to Halt a Highway."
3. THE DEATH OF THE AUTOMOBILE by John Jerome; Norton, N.Y., 1972, \$6.95. Chapter and verse on the environmental, social, urban depredations of the auto and its highways.
4. SUPERHIGHWAY -- SUPERHOAX by Helen Leavitt; Ballantine, N.Y., 1971, 95 cents.
5. THE FUTURE OF AMERICAN TRANSPORTATION, edited by Ernest Williams, Jr.; Prentice-Hall, Englewood Cliffs, N.J., 1971, \$2.45. On how actions of the Interstate Commerce Commission work against the public interest.
6. BEYOND THE AUTOMOBILE: RESHAPING THE TRANSPORTATION ENVIRONMENT by Tabor R. Stone; Prentice-Hall, Englewood Cliffs, N.J., 1971, \$2.45.
7. THE METROPOLITAN TRANSPORTATION PROBLEM by Wilfred Owen; Anchor, Garden City, N.Y., 1966. A Brookings Institute study.
8. READINGS IN URBAN TRANSPORTATION, edited by George M. Smark; Indiana U. Press, Bloomington, 1968. Includes champions of both highways and mass transit.
9. ROAD TO RUIN by A. Q. Mowbray; Lippincott, N.Y., N.Y., 1968, 1969, \$5.95. A critical review of the Federal Highway Program.
10. THE URBAN TRANSPORTATION PROBLEM by J.R. Meyer, J.F. Kain, and M. Wohl; Harvard U. Press, Cambridge, 1965.
11. NEW MOVEMENT IN CITIES BY Brian Richards, Reinhold, N.Y., 1966.

Publications

1. URBAN PUBLIC TRANSPORT: SERVICE INNOVATIONS IN OPERATIONS, PLANNING AND TECHNOLOGY by Robert A. Burco; published by Organization for Economic Cooperation and Development, Paris, Sept., 1972. An inquiry into the impact of the motor vehicle on the environment.
2. FUTURE DIRECTIONS FOR RESEARCH IN URBAN TRANSPORTATION the findings and contributions of a panel of experts in transportation, engineering, economics, urban planning, architecture and city administration brought together under the aegis of the Organization for Economic Cooperation and Development and published by the OECD in Paris, 1969.

3. FUTURE URBAN TRANSPORTATION SYSTEMS: IMPACTS ON URBAN LIFE AND FORM. Final Report I by Mark Henderson, et al. Final Report II by Robert A. Burco and David A. Curry. Prepared for the Urban Transportation Administration, Department of Housing and Urban Development, Washington, D.C., and by the Stanford Research Institute, Menlo Park, California, 1968.
4. TOMORROW'S TRANSPORTATION -- NEW SYSTEMS FOR THE URBAN FUTURE, U.S. Department of Housing and Urban Development, Washington, D.C., 1972.
5. URBAN TRANSPORTATION RESEARCH AND DEVELOPMENT, National Academy of Engineering, Washington, D.C., 1972.
6. THE URBAN TRANSPORTATION PLANNING PROCESS published by the Organization for Economic Cooperation and Development, Paris, 1971. This is a report on a meeting sponsored by the OECD on such subjects as "On Strategies for Transport Planning" and "Towards the Maximizing of Urban Transportation Potentials."
7. URBAN TRAFFIC NOISE, a report of the Consultative Group on Transportation Research of the Organization for Economic Cooperation and Development in Paris, 1971. It is subtitled "strategy for an improved environment."

Articles

1. "Transportation and Pollution" by Edwin H. Marston; NORTH AMERICAN REFERENCE ENCYCLOPEDIA OF ECOLOGY AND POLLUTION; North American Publishing Co., Philadelphia, 1972. (edited by William White, Jr. and Frank Little, Jr.)
2. "The Impact of the Automobile on the Environment," THE OECD OBSERVER, Aug., 1971, published by the Organization for Economic Cooperation and Development, OECD Information Service, Chateau de la Muette, 2 rue Andre Pascal, F 75 Paris 16 e.
3. "Very Slowly, But Steadily, Radical Changes in Urban Transportation Are Taking Place," CF LETTER, Nov. 1972, The Conservation Foundation.
4. "Congress Is Poised To Vote Another Heavy Dose of Highways As The Urban Transportation Dilemma Continues," CF LETTER, Oct., 1972, The Conservation Foundation.
5. "Fare Hike Linked to Pollution" by Steve Lawrence; THE NEW YORK POST, May 24, 1973.

6. "Transit Deficits Continue to Rise as Number of Riders Declines" by Robert Lindsey; THE NEW YORK TIMES, Mar. 8, 1971.
7. "Poll Backs Public Transport," THE NEW YORK POST, April 2, 1973.
8. "Traffic in Cities," ARCHITECTURAL FORUM, Jan.-Feb., 1968. Special issue examines complexity of the city, various transportation subsystems, projected new rail systems, air transport, and pedestrian use of roadways.
9. "Improving Urban Transportation" by Lyle G. Fitch, THE FUTURE OF AMERICAN TRANSPORTATION, edited by Ernest W. Williams, Jr., Prentice-Hall, Englewood Cliffs, N.J., 1971.
10. "Fast Trains," ENVIRONMENT, April 1973. On innovative approaches to rail systems.
11. "Highway Fund: In Goes Money, Out Comes Concrete" by Wade Greene; THE NEW YORK TIMES, Jan. 16, 1972.
12. "What Is The Role of the Highway in Society and the Environment," CF LETTER, June 1970. The Conservation Foundation.
13. "Let's Put Brakes on the Highway Lobby" by George Denison and Kenneth Y. Tomlinson; THE READER'S DIGEST, May 1969.
14. "Davis Offers \$1.3 Billion for Pushbutton Transit", the TORONTO GLOBE AND MAIL, Nov. 23, 1972.
15. "Environmental/Hamburg: Urban Transit Model," SATURDAY REVIEW, DEC. 5, 1970.
16. "The Agony of the Commuter," NEWSWEEK, Jan. 18, 1971.
17. "Free Subways and Buses and All!" THE NEW YORK TIMES, Jan. 6, 1972.
18. "Japanese Railways Plan To Revolutionize Transit" by Takasi Oka; THE NEW YORK TIMES, June 21, 1970. On the expansion of the high-speed rail system.

Films*

1. AUTO - ENVIRONMENT, 15 min., color, purchase from Media for the Urban Environment \$250, rental \$12, produced in 1972. This film describes the ravages the auto perpetrates on New York City and recommends banning cars from congested areas and presents suggestions for free mass transit systems, pedestrian avenues and bike lanes. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

2. THE TROLLEY - BY GOLLY, 20 min., color, purchase from Perennial Education \$210, rental \$21, produced in 1971. A look back to when local travelling was fun. Jr. high school to adult.
3. HAPPY ANNIVERSARY, 12 min., b & w, purchase from Trans-World Films \$75, rental \$7.50, produced in 1962. Slapstick sarcasm over the mishaps -- traffic jams, no parking place, etc. -- that befall the Parisian hero as he tries to hurry home to his wife on their wedding anniversary. Jr. high school to adult.
4. TRAFFIC ROUND THE WORLD, 26 min., b & w, purchase from CCM Films \$150, rental \$10, produced in 1964 by CBS News. A look at earlier vintage traffic jams that appear thoroughly contemporary; New York Traffic Commissioner Henry Barnes gives some advice on the need for improved mass transit that has not been heeded. Jr. high school to adult.

Organizations

1. Committee on Transportation
Scientists' Committee for Public Information
30 East 68th St.
New York, N.Y. 10021
2. Transportation Research and Planning Office
Ford Motor Company
Dearborn, Michigan
3. Transportation Research and Planning Office
General Motors Corporation
Warren, Michigan
4. Jet Propulsion Laboratories
Pasadena, Calif.
5. Regional Plan Association
235 East 45th St.
New York, N.Y. 10017
6. West Virginia University
Morgantown, W.V.

Government Agencies

1. Department of Transportation
400 7th St. SW
Washington, D.C. 20590
Federal Highway Administration
Federal Aviation Administration
Federal Railroad Administration
Urban Mass Transportation Administration
(The latter seeks to improve urban environments through grant programs to upgrade existing mass transit and to develop new methods.)

2. Organization for Economic Cooperation and Development
2 rue Andre-Pascal
Paris 16, France
(This organization of industrialized nations has made extensive studies of urban transport and its impact upon environment.)
3. Office of Air Programs
Environmental Protection Agency
U.S. Waterside Mall
Washington, D.C. 20460
(Also through EPA's monitoring and enforcement programs)
4. Bay Area Rapid Transit District
Oakland, Calif.
5. New York State Public Service Commission
44 Holland Avenue
Albany, New York
5. New York State Department of Transportation
Motor Carrier Unit
State Campus Building #2
Albany, N.Y.
(Carries out functions of Public Service Commission.)

THE LIMITS TO GROWTH



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THE LIMITS TO GROWTH

Perspective

A telltale characteristic of human beings is insatiable curiosity. Human beings are forever interested in knowing more about their fellows, and this curiosity fuels the never-ending pursuit of gossip. More importantly, human beings have thirsted to understand their world, and this motive force has given us religion, philosophy, and science. Possibly the question most frequently asked by humans is: What happens next? And that recurring question produced Homer and Shakespeare, our storytellers; our literature; and, since the dawn of the species, soothsayers, seers, palmists, prognosticators, prophets -- storytellers in the future tense who predict what will happen next.

Possibly the most famous forecaster of human history lived more than 3,000 years ago. Cassandra was a daughter of Priam, king of Troy, a city-state in what is now the western part of Turkey. Troy was so well fortified on high ground above the plains where the Greek warriors were deployed that it was obvious after years of siege that Troy was impregnable. Nevertheless, Cassandra predicted its doom. Since such a forecast seemed so out of keeping with the facts before the eyes of any Trojan, Cassandra's forebodings were ignored; some Trojans doubted her sanity. After all, what rational person would accept the prediction of catastrophe -- even a knowledgeable person of today placed in such circumstances -- when everything that had happened indicated that such an outcome would not take place?

We know what did happen. The Greeks pretended to accept their seemingly inevitable failure only to infiltrate the fortress city through a ruse, the famous hollow horse. This eventuality was virtually impossible to foresee, particularly by people whose foresight was dimmed by complacency.

Foretelling the future, it happened, was a more fundamental part of the Greek culture that developed during the centuries following the sack of Troy about 1184 B.C. Prognosis, predicting the course of a disease and its effect on the patient, was an important part of Hippocratic medicine. And the oracle at Delphi was one of the special living deities of Greek civilization; to this shrine came the many pilgrims who wished to savor their coming good fortune and possibly avoid the bad.

Predicting the occurrence of future events has lost none of its allure as the popularity of Nostradamus, Jeanne Dixon, and Aldous Huxley's Brave New World attest. The prediction of weather has gradually moved from guesswork and intuition toward the science of meteorology, and, as the science becomes more reliably predictive, its value grows. Many outdoor commercial ventures or voyages now are predicated on the future-viewing of meteorologists. And the unforeseen course of a hurricane, such as Carole or Agnes, results in many deaths and enormous destruction.

Businessmen long have had an interest in knowing what will transpire in the months and years immediately ahead. Would there be increased demand for their products or would their particular market begin to dwindle? If they wished to market a new product, would it sell; would it be economically worth while to go to all the cost of tooling up, distributing, and promoting product X? Businessmen devised various empirical ways of pretesting a product -- a sneak preview for a motion picture, for instance, or the sale of a new baby food in a few limited, closely observed areas.

With system dynamics, a highly valuable predictive tool was applied to this kind of problem. The relationships within a business organization were studied, and so were various economic factors pertinent to the company as well as its proposed new product. All this information was programed into a computer. Then the computer could show what would be most likely to happen -- both to the product and to the company itself -- under various sets of contingencies. This was not a foolproof forecast of one sure train of events, but rather an educated look at several probable ways that developments might unfold with certain probabilities as to the likelihood of each course: what would happen if this or that set of circumstances took place.

A pioneer of this research into industrial dynamics, Professor Jay Forrester at Massachusetts Institute of Technology, learned that there were few, if any, direct, simple cause-and-effect relationships in complex systems, that, instead, effects resulted from the interactions of a number of events taking place at the same time. This kind of an arrangement -- a number of things happening simultaneously to produce an observed effect -- is beyond the ready comprehension of the human observer. The human mind has great difficulty in keeping track of actions and reactions all going on together and affecting one another in cybernetic fashion. But the workings of a complex system and its nonlinear affects can be represented by a well-programed computer. Forrester came to

realize that, during the course of human experience, the human mind has learned to reason from a one-to-one relationship, from immediate cause to observable effect. But with complex systems, he saw things happen in counter-intuitive fashion and thus require a new system of analysis or thinking.

Forrester went on to apply his method to such complex systems as cities, and finally to the world ecosystem. This work was brought to international attention with the book, The Limits to Growth, by Dennis Meadows and a team commissioned by a group of leading industrialists, scientists, and educators concerned about the direction in which human society was heading. Their common concern united them in a loose, rather informal, organization they called the Club of Rome. What they saw was a world heading toward overpopulation; pervasive pollution, deteriorating land, sea, and air; urban blight, alarming consumption of resources.

And so five major factors -- food production, consumption of resources, population, pollution, and capital investment -- were studied and programed into a computer. Their various interactions were studied under various contingencies -- where population kept growing without restraint, for instance, or pollution was controlled, but capital investment went on unabated. What these researchers found was that unless human population and capital investment were voluntarily brought under control, there would be a "crash" of population and standard of living within a century, and quite possibly earlier.

This was essentially the grim forecast of Thomas Malthus 175 years ago, a prediction which never came to pass; it had been forestalled by the prodigious accomplishments of the Industrial Revolution. The Limits to Growth triggered one of the most heated and most basic controversies concerning present world policy.

The broadcast deals with that controversy.

The Broadcast: THE LIMITS TO GROWTH

This broadcast inquires into the question of whether there are inherent limits to growth, particularly economic growth.

The Limits to Growth begins with a series of conflicting statements about whether further growth is desirable, necessary, possible. This introductory segment sets the stage at present, where we are now. But the heart of the matter really, is a debate about the future. A conclusive answer cannot be

"proved" in the present. Yet it is important to arrive at some satisfactory projection about what will happen in order to guide the policy of nations and the behavior of their peoples.

To begin this examination of the phenomenon of growth, we see that each organism or artifact has a proper size for its function or purpose: size is related to function. The biological process limits the growth and sizes of various organisms so that their parts have characteristic proportions for the functions they perform. Persistent, unregulated growth of some parts or organs of the body after an individual reaches maturity is what we call cancer.

Whether cells or mammals, organisms can grow only so big because volume and needs grow faster than they can be supported beyond a certain point. The elephant requires massive legs to support its ponderous bulk, and in the elephant the limits to growth are indicated. In some concepts, however, limits are vague, and one wonders if they are necessary. Is there a limit to knowledge or love? Are there limits to a people's well-being and efforts to escape from poverty? In the realm of economics, there is complete disagreement on the question of whether a brake should be applied to economic development and investment.

The broadcast then traces the evolution of the market system as it developed from the 13th century, and of economic theory beginning with Adam Smith's The Wealth of Nations in 1776. Smith saw the mainsprings of the economic world as self-interest and competition. He observed the great gains in production achieved by the division of labor as well as the expansion of markets by the accumulation of capital which was reinvested to enlarge production still more. Adam Smith believed that there was no reason why production could not grow indefinitely.

Because, said Thomas Malthus, it will be overwhelmed by human population, which grows faster than the production of food and goods. As population outruns production, the losers in the race are eliminated by the great killers -- poverty, disease, and famine -- and society is disrupted. Thus began, at the turn of the 19th century, a great debate which has not abated to this day.

As the Industrial Revolution developed during the 19th century, it produced things neither the optimistic Smith nor the pessimistic Malthus foresaw, such as child labor and dreary factory working conditions, but also the life-saving capacity to produce food and goods faster than population grew. And so the dire Malthusian predictions never came to pass.

The market system was plagued with chronic instability, and the Great Depression of the 1930's showed no signs of passing; in fact, economic conditions kept spiralling to ever-lower levels of production, investment, and consumption. It was at this point that a brilliant British economist John Maynard Keynes, discovered that unless economic conditions became -- or are made -- suitable for renewed economic investment so that production can expand once again, a society is unable to break the grip of economic depression. If private enterprise could not take those first economic steps, then governments must "prime the pump." Keynes' theories worked.

Moreover, he says that, despite the transient ups and downs, the booms and busts, the steady trend of capitalism was upwards: with each generation, production and its benefits grew larger. And, at the rate it was growing in Western industrialized nations, Keynes calculated, by the year 2030, the economics of scarcity which had plagued mankind throughout its history would be replaced by an economics of plenty. As we have seen, this affluence began to appear even more quickly after World War II in the United States. And so economists came to see the benefits, the utility of economic growth: they came to see it as the direct route to the good life.

Like economy, ecology stems from the same Greek word. The two sciences study such things as populations, growth and development, competition, and the movement of resources and materials through systems. However, until now the two sciences have coexisted in isolation -- one concentrating on the human world, the other on the world of nature. Ecologists observed that whenever any population, whether bacteria or deer, or a community of populations such as a forest, approached the limits of the supporting resources, it stopped growing and came into an equilibrium with its surroundings; and continued in this "steady state" arrangement. This concept, of course, clashed with the economic notion of never-ending growth.

The two worlds were brought closer together by systems management scientists using computers. In the controversial book, The Limits to Growth, Dennis Meadows and his colleagues found, on the basis of computer projections, that human population (which is growing at a rate of 2 percent a year, which means it would double every 35 years) and industrial growth (which is expanding at an even greater rate) will come to a screeching halt one way or another within a century -- or at about the time economist Keynes was envisioning a world of plenty for all. Because of this explosive growth, the Meadows team said, humans will exhaust nonrenewable resources, produce uncontrollable pollution, and/or run out of food. These forecasters quickly became known as the new Malthusians.

Economists responded to this prediction with several forms of counterattack. For one, they said that the computer model of world relationships was too simple, and the data was too incomplete to arrive at a reliable projection. U.N. experts stated that energy resources and other minerals were far more ample than The Limits to Growth allowed for, that new scientific techniques would greatly expand most resources as needs arose. Only fresh water supplies, the U.N. experts said, would become limited in the foreseeable future. Finally, most economists were unshakeably convinced that economic growth is essential to eradicate world poverty.

To this, Meadows replies that with economic growth the gap between rich and poor keeps growing. Before the Industrial Revolution, there were no great discrepancies in living standards. By 1850, incomes in industrialized nations were twice as high as they were in the rest of the world. By 1950, the ratio was 10 to 1, today it is 15 to 1, and by the end of the century it may reach 30 to 1. Meadows contends that the rich-poor gap might be narrowed by removing the pressures of economic growth.

Essentially, he says, the two strategies are based on two divergent views of the world. The expansionist rationale is founded on a belief that man is so intelligent that he can solve any problem if he puts his mind to it, and a second belief that all the goods and creatures on the planet -- all of nature -- are subservient to man's needs and whims. The opposite viewpoint is that life is a web of millions of species; man has been the most successful competitor and thus has come to assume a crucial role in the welfare of all. Nevertheless, human welfare is completely dependent on many of those other species and the integrity of the biosphere.

It is just possible that with such efforts as The Limits to Growth, the two points of view are moving toward a single focus. The contentions that both human population and human economic development must come to an end have come under increasing consideration. And, for the first time, economists and ecologists have begun to talk to one another. Out of such a dialogue could come acceptance that it is, obviously, only one world.

What can I do?

You can ask yourself questions. And then try to find the answers that are satisfactory to you.

Perhaps more than any other subject in this environmental series, the limits to growth controversy is abstract, cerebral, theoretical, seemingly "beyond" the puny sphere of the individual. It is concerned with global issues, trends, and policies. It

has been presented as a theoretical argument among experts and specialists that appears to exclude the individual citizen. But, as we can see in the conclusion to the broadcast, the great debate rests finally upon ideological foundations, upon conflicting viewpoints of the world and the human role in it. And that question must be -- is -- answered in one way or another by each individual. For each of us consciously or unconsciously chooses certain standards, prefers certain values in order to guide his behavior. Although we don't normally employ computers, nevertheless each of us has formed mental models of what we believe life is and/or should be; and we act according to those models.

What makes decisions particularly difficult in this area is that there do not appear to be absolute or unqualified answers. Answers vary with individuals and groups and circumstances. For citizens in advanced industrialized societies, sustained economic growth has provided material blessings and an improved standard of living. It has enhanced the quality of life, fulfilling many of the dreams of 18th century utopian idealists, specifically in providing an unprecedented level of general health, educational opportunity, and a chance for personal realization in addition to freedom from hunger and want. Now, the underprivileged two-thirds of mankind has seen by this example what can be done through this mechanism of economic expansion. They are inspired to want no less. Even in the affluent societies, the poorer people desire economic equality in what has been called the revolution of rising expectations.

In this last moment of history, ecologists have climbed onto the national and international forum to warn that there are accelerating environmental costs to the spiralling material benefits. Pervasive pollution is part of the bill that has not been paid and which we may continue to defer only at our peril -- in health and in the quality of environment and enjoyment of surroundings that sustains the good life. Too many people, too many resource-hungry enterprises, too many urban sprawls and space hungry automobiles can sabotage the desirable state of affairs that more modest amounts of these entities brought about in the first place.

So some of the questions citizens in affluent societies are now being forced to ask themselves are: How much will satisfy me? Where are the limits to my personal needs, the boundaries to my desires...at least in regard to material things? Already, success in the quest for material well-being, or the exclusive emphasis in its pursuit, has exposed impoverishment in other areas of life. As President Nixon noted in his State of the Union message, material things do not necessarily guarantee the happy life. Man, it was pointed out nearly 2,000 years ago, does not live by bread alone.

Unquestionably, a person with an empty belly and malnourished children cannot afford the luxury of worrying about these other valuable ingredients of existence. His needs are immediate, overriding, and economic. And so his questions are different...or the same ones most people have asked through human history until this present time. But do people in affluent societies really want a world of 2000 A.D. where average incomes in industrialized nations are 30 times as great as those in the underdeveloped countries? Should citizens of North America, Western Europe, Russia, and Japan utilize 90 percent of the world's energy? Can a house so divided stand?

These questions are implicit in the limits to growth controversy. So far, there are no real answers.

Underneath all these questions is the fundamental question raised, or suggested, by ecology. Strangely, it is not a question with a scientific or technological answer, although it may have scientific boundaries and imply technological actions. It is an ethical question: Just how much of this planet is the human species entitled to? Do other life forms have any "rights"? How are we to regard nature? Is all of nature absolutely subservient to us? Is the human species the be-all and end-all? And do we have some legitimate authority to do whatever we wish to satisfy our ever-burgeoning wants and needs? Or at some point do we become usurpers? These are strange questions. They have never been posed before except in the context of our religions. And so it may not be so odd that population biologist Paul Ehrlich, contemplating the enormity of the looming human predicament, said, in Among the Living:

"The horror of our present situation, or maybe the interest of it is that the solutions that are left to man are the ones that we always laughed at before as being too idealistic, or too Christian, or too utopian, and now they're the only ones that are left. I think most people can see this most clearly in the area of warfare. We're either going to have to find different ways of settling our disputes, we've always talked about peaceful ways, or sooner or later we're going to blow ourselves up. Well, a similar thing really pertains in almost all the areas of human problems including the population-environment crisis. We're either going to find a different way to do things, or we're going to be blown up in one way or another."

Answers to the above questions may be theoretical, but they lead to real consequences. People resolved to curtail the use of energy, to conserve the demands on resources, to reduce the pressures on population can find some useful suggestions in the What can I do? sections of SCARS ON THE SURFACE, THE CAR IN THE CITY, SIX FATHOMS DEEP, and AMONG THE LIVING.

For further information

Books

1. THE LIMITS TO GROWTH by Donella Meadows, Dennis Meadows, Jorgen Randers, and William Behrens III; Universe Books, N.Y., 1972, \$2.75. This is the volume, written so that everyone can understand, that triggered the great debate on whether growth -- particularly economic growth, but also that of the human population -- should be stopped.
2. WORLD DYNAMICS by Jay W. Forrester; Wright-Allen Press, Cambridge, Mass., 1971, \$9.75. Professor Forrester's systems dynamics approach with the world's ecosystem as the model. This is the model upon which the better known book, The Limits to Growth, is based.
3. BLUEPRINT FOR SURVIVAL by Edward Goldsmith, Robert Allen, Michael Allaby, John Davoli, and Sam Larence; Houghton Mifflin, Boston, 1972, \$4.95. The proposal, in book form, first printed in the English magazine THE ECOLOGIST to reduce Britain's population by half and adopt better ecological ways of doing things as a means of survival.
4. URBAN DYNAMICS by Jay Forrester; M.I.T. Press, Cambridge, Mass., 1969.
5. TECHNOLOGY AND GROWTH by E.J. Mishan; Praeger, N.Y., 1970, \$7.95. This book, by an iconoclastic English economist, details the various costs and drawbacks -- many of them previously overlooked completely -- inherent in unceasing economic, industrial, and population growth. This volume is written for the layman without the technical data in the substantially similar The Costs of Economic Growth by Mishan published by Praeger in 1967.
6. RESOURCES AND MAN, a study and recommendations by the Committee on Resources and Man, National Academy of Sciences/National Research Council, W.H. Freeman; San Francisco, 1969, \$2.95. An educated look at nonrenewable resources and their limitations with present and expected use.
7. THE RETREAT FROM RICHES: AFFLUENCE AND ITS ENEMIES by Peter Passell and Leonard Ross; Viking, N.Y., 1973. Two Columbia University economists defend and explain the need for continued economic growth.

8. WORLD WITHOUT BORDERS by Lester Brown; Random House, N.Y., 1972, \$8.95. A planning authority foresees the need to abandon the pursuit of superaffluence in rich countries, stabilize populations, and re-order global priorities in order to accommodate the human population to its environment -- and this means a world order based on cooperation and a sense of community.
9. THE CARELESS TECHNOLOGY: ECOLOGY AND INTERNATIONAL DEVELOPMENT, edited by M. Taghi Farvar and John P. Milton; Natural History Press, N.Y., 1972, \$25. An exhaustive study of untoward ecological effects of development upon primitive areas.
10. TOWARD GLOBAL EQUILIBRIUM, edited by Dennis and Donella Meadows; Wright-Allen Press, Cambridge, Mass., 1973, \$20. Volume II of the Report to the Club of Rome on limits to Growth. A compendium of substudy simulation reports and interpretive papers.
11. PRINCIPLES OF SYSTEMS by Jay Forrester; Wright-Allen Press, Cambridge, Mass., \$8.
12. THE WORLDLY PHILOSOPHERS by Robert Heilbroner; Simon and Schuster, N.Y., 1953. A lucid and readable account of the ideas and lives of the important economic thinkers.
13. ONLY ONE EARTH by Barbara Ward and Rene Dubos; Norton, N.Y., 1972, \$6. An unofficial report for the Stockholm Conference, prepared with the assistance of a 152-member committee of corresponding consultants in 58 countries and dealing with policies of growth, development, technology, resources, and related subjects.
14. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., 1971, \$6.95. A detailed description of the role of technology, particularly certain kinds of technology, in causing environmental pollution.
15. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER AND AIR GONE? by Osborn Segerberg Jr.; McKay, N.Y., 1971, \$2.95. A description of the science of ecology and its implications for the layman.
16. RESOURCES IN AMERICA'S FUTURE: PATTERNS OF REQUIREMENTS AND AVAILABILITIES, 1960-2000 by Hans Landsberg, Leonard Fischman, and Joseph Fisher for Resources For The Future, Inc.; John Hopkins Press, Baltimore, 1963, \$15. One thousand pages on RFF investigations and estimates.

17. AFFLUENCE IN JEOPARDY by Charles F. Park Jr.; Freeman, Cooper, San Francisco, 1968. A geologist-businessman's view of the limitation of mineral resources.
18. POPULATION, EVOLUTION, AND BIRTH CONTROL, edited by Garrett Hardin; Freeman, San Francisco, 1964, 1969. Readings from Malthus, comments on population growth and the phenomenon of doubling and including the editor's own nonclassic contribution to the subject, "The Tragedy of the Commons."
19. SCARCITY AND GROWTH: THE ECONOMICS OF NATURAL RESOURCE AVAILABILITY by Harold J. Barnett and Chandler Morse for Resources For The Future; Johns Hopkins Press, 1965, \$2.25.
20. THE ECONOMICS OF ENVIRONMENTAL PROBLEMS, edited by Frank Amerson; Michigan Business Papers No. 58, University of Michigan, Ann Arbor, Mich. 48104. \$5.

Publications

1. FUTURES, Vol. 5, No. 1, February 1973. This is a special issue devoted to the controversy over The Limits To Growth. It includes a detailed critique by the University of Sussex Science Policy Research Unit with a rebuttal by the authors of The Limits To Growth. FUTURES is a journal of forecasting and planning published by IPC Science and Technology Press in Surrey, England, in cooperation with the Institute for the Future in the United States. IPC Science and Technology Press also has an office at 205 E. 42nd Street, New York City.
2. FUTURES, Vol. 5, No. 2, April 1973. This issue devoted five articles to the ideological background of the controversy over the limits to growth.
3. PROJECTIONS OF NATURAL RESOURCES RESERVES, SUPPLY AND FUTURE DEMAND, published by the United Nations Economic and Social Council, E/C. 7/40; it is a report by the Secretary-General presented to the Council's Committee on Natural Resources meeting in New Delhi in February 1973. E/C. 7/40Add.1, "World Energy Reserves, Supply and Demand" gives a definitive estimate by U.N. experts indicating that reserves of renewable resources are far greater than taken into consideration by The Limits To Growth and that prospects for such unlimited energy sources as solar or fusion and geothermal energy are

bright for the long run. E/C. 7/40 Add.2, "Projections of Mineral Resources," gives a definitive accounting for world reserves, again with an optimistic outlook. NATURAL RESOURCES DEVELOPMENT AND POLICIES INCLUDING ENVIRONMENTAL CONSIDERATIONS, E/C. 7/2, "Natural resources problems and issues: a general review," sums up the whole picture, which is generally bright with the exception of fresh water.

4. ECONOMIC GROWTH, a monograph by William Nordhaus and James Tobin; published by the National Bureau of Economic Research (see Organizations), 1972, in which the two Yale economists present their alternative to gross national product. Their measurement index, Net Economic Welfare, is intended to be a much more complete gauge of values that make up quality of life as well as quantity of material things.
5. THE IMPLICATIONS FOR GOVERNMENT ACTION OF "THE LIMITS TO GROWTH" was written by Walton J. Francis, a program analyst in the U.S. Department of Health, Education and Welfare's Office of Planning and Evaluation. This is not an official HEW position paper. The analyst concludes that there is no immediate prospect of a breakthrough in measuring the quality of life and that there is no need for drastic government action to curtail growth to prevent ecological catastrophe. The study may be obtained from Office of Public Affairs, Room 5541, Department of Health, Education and Welfare, North Building, 300 Independence Avenue SW, Washington, D.C. 20201.
6. THE FUTURIST is a journal of forecasts, trends, and ideas about the future published by the WORLD FUTURE SOCIETY (See Organizations). The Dec. 1972 issue features "Global Trends: Population, Environment, Education, Urbanization, Transportation, Communications, and what they may mean for the future."

Articles

1. "Blueprint for Survival" by Edward Goldsmith, Robert Allen, Michael Allaby, John Davoli, and Sam Lawrence, THE ECOLOGIST, a magazine published in London, Jan. 1972. The article, endorsed by 33 of England's leading scientists, says that the United Kingdom must eventually cut her population in half and cut the growing use of resources and continuous economic development if the British peoples are to survive. "Blueprint for Survival" is a companion to The Limits To Growth in challenging the credo of never-ending economic and population growth.

2. "Continuous Growth or No Growth? What the Ecologists Can Teach the Economists" by Bertram Murray, Jr., THE NEW YORK TIMES MAGAZINE, Dec. 10, 1972. A lucid comparison of the two sciences.
3. "Economics and Ecology" by Kenneth Boulding, FUTURE ENVIRONMENTS OF NORTH AMERICA, edited by F. Fraser Darling and John Milton; Natural History Press, Garden City, N.Y., 1966, \$12.50. An economist with a strong interest in ecology compares the two sciences, stating parallels and differences.
4. "Questions Must be Raised About the Imminence of the Disaster" by Leonard Silk, THE NEW YORK TIMES, March 13 and 14, 1972. An economist's rebuttal of The Limits To Growth.
5. "Growth vs. Environment" by Leonard Silk, THE NEW YORK TIMES, Dec. 20, 1972. A discussion, 9 months later, of the impact on economists' thinking caused by concern over population and industrial growth.
6. "Can the World Survive Economic Growth?" an essay in TIME, Aug. 14, 1972, which concludes that growth must go on, but much more selectively than in the past.
7. "Unlimited Growth: Growing, Growing, Gone?" by F.H. Bormann, BIOSCIENCE, December 1972. This was a Presidential address delivered to the Ecological Society of America, Aug. 29, 1972.
8. "From GNP to NEW" by Paul A. Samuelson, NEWSWEEK, April 9, 1973, in which Nobel Prize-winning economist describes the efforts of modern political economy to measure the quality as well as quantity of life, and to do so with a substitute for Gross National Product -- Net Economic Welfare.
9. "Fun and Games with the Gross National Product -- The Role of Misleading Indicators in Social Policy" by Kenneth Boulding, THE ENVIRONMENTAL CRISIS, edited by Harold Helfrich, Jr.; Yale University Press, New Haven, 1970, \$1.95.
10. "The Limits to Growth: A Critique" by Mahbub ul Haq, FINANCE AND DEVELOPMENT, a publication of the International Monetary Fund and World Bank Group, Vol. 9, No. 4, Dec. 1972. The article is based on a World Bank team analysis of The Limits To Growth.

11. "Growth Is Not Development" by Samir Amin, Director of the African Institute for Economic Development and Planning, DEVELOPMENT FORUM, a publication of the U.N. Centre for Economic & Social Information in Geneva, Switzerland, (Vol. 1, No. 3, April 1973). The article points out that industrial investment merely to produce trinkets for developed nations may be of little benefit to the needs of developing countries in which they are situated; thus, he argues for home-grown industry to benefit the natives.
12. "Indiscriminate Economic Growth, Measured With Little Regard For Environmental Costs and Social Well-Being, Is Challenged," CF LETTER, May 1971, The Conservation Foundation, Washington, D.C.
13. "An Overview of World Trends" by Lester R. Brown and the editors of THE FUTURIST, THE FUTURIST, Dec. 1972. A good summary of population, urban, economic growth, growth of population, urban, economic, and rich-poor gap. See Publications.
14. "The Luddites Were Not All Wrong" by Wade Greene and Soma Golden, THE NEW YORK TIMES MAGAZINE, Nov. 21, 1971. A good summary of the unorthodox views of British economist Ezra Mishan on the many costs, some of them hidden, of growth that overbalance benefits.
15. "Weight-Watching at the University: The Consequences of Growth" by Jonathan Gallant and John Prothero, SCIENCE, Jan. 28, 1972, in which the authors weigh the benefits and drawbacks of various-sized universities and conclude that the optimum size is about 10,000 students and certainly no more than 15,000.
16. "Severe Shortage of Ores Is Feared: Report by Geological Survey Warns Against Waste and Urges New Techniques" by Harold Scmeck, Jr., THE NEW YORK TIMES, May 9, 1973. A news report on a 722-page assessment by the U.S. Geological Survey of mineral use and resources in the United States, the first such essay in 21 years. The document disavows both the forecasts of doom and the predictions of optimists.

Films*

1. THE MAN-MADE WORLD -- THE LIMITS OF GROWTH, 24½ min., color, produced by the British Broadcasting Company for its Open University Program. The film shows Professor Jay Forrester, Dennis Meadows on their computer program forecasts about the coming world crisis.

*Addresses of film distributors are given at the end of this guide.

Organizations

1. National Bureau of Economic Research
261 Madison Avenue
New York, N.Y. 10016
(For more than half a century, the Bureau has sponsored the presentation of facts related to economics and impartial interpretations to the public.)
2. Centre for Economic and Social Information
United Nations Headquarters
New York, N.Y. 10017
(In the Spring of 1973, the United Nations began a 2-year study of the future impact (in 1980, 1990, 2000, 2020) of continued economic and population growth on the environment with special attention to problems raised in The Limits To Growth.)
3. Committee on Natural Resources
Economic and Social Council
United Nations, N.Y. 10017
(This group says that world resources, except for water, are in plentiful supply.)
4. U.S. Geological Survey
18th and F Streets, N.W.
Washington, D.C. 20242
(The Survey's first assessment in 21 years foresees severe shortages of national mineral resources in the next few decades unless there is a curtailment of waste and ex-orbitant use and a turn to low-grade ores.)
5. Bureau of Mines
18th and C Streets, N.W.
Washington, D.C. 20240
(A prime source of national and world mineral information.)
6. Resources For The Future, Inc.
1755 Massachusetts Avenue, N.W.
Washington, D.C. 20036
(Conducts resource studies from an economic viewpoint.)
7. National Coal Association
Coal Building
Washington, D.C. 20036
8. American Petroleum Institute
1801 K St., N.W.
Washington, D.C. 20006
9. World Future Society
P.O. Box 30369
Bethesda Branch
Washington, D.C. 20014
(A nonprofit educational and scientific association devoted to the study of alternative futures. See also Publications.)

THE VANISHING BREED



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THE VANISHING BREED

Perspective

When the stars threw down their spears,

And water'd heaven with their tears,

Did he smile his work to see?

Did he who made the Lamb make thee?

Tiger! Tiger! burning bright

In the forests of the night,

What immortal hand or eye

Dare frame thy fearful symmetry?

It took the mystical vision of the poet, William Blake, to perceive what we all recognize, once it is pointed out: the beauty, the awesome presence, and lissome grace of the great striped cat. The power masked, until this last moment of history, how vulnerable is this majestic beast. Now, we know, the species is in danger of extinction. Fifty years ago, some say as recently as 20 years ago, there were 40,000 tigers; today, there are about 2,800. Those are National Wildlife figures. A survey taken in India puts the number as low as 1,500.

What economist can measure the Gross National Poverty of a world without tigers, without whales, without pelicans, without eagles? It was another English poet who assayed the cost, and its nature, when he said, "No man is an island entire of itself; every man is a piece of the continent, a part of the main. If a clod be washed away by the sea, Europe is the less, as well as if a promontory were, as well as if a manor of thy friend's or of thine own were. Any man's death diminishes me, because I am involved in mankind, and therefore never send to know for whom the bell tolls; it tolls for thee."

John Donne, of course, was thinking of the deaths of individuals of our own species. But with today's far greater ecological knowledge, we can see that Donne's words apply equally well to the web of life. The loss of a species removes a strand from the web, weakens the fabric of nature, diminishes the colorful variety of the tapestry, impoverishes the survivors. The loss is particularly grievous when the species is a mammal, the group

of life-forms closest to ourselves. If such a lamentation sounds sentimental, or excessive, what counselor can calculate the toll upon the human psyche of the environment of monotony toward which we are rushing?

It is true that species have come and gone and changed as life adapted to the slowly shifting environment during the eons of evolution. However, the changes -- particularly the disappearances -- are beginning to resemble film that has been speeded up so that everything has an unnatural, Chaplinesque movement. Three hundred and fifty-nine species of animals have become extinct since the year 1600. That's close to an average loss of one species a year, except that most of these losses have occurred during the last part of the period. The pace of extinctions is accelerating so that, today, species are disappearing at a rate four times that of 1600. Today, 922 species of animals are in danger of extinction. Biologists so far have cataloged 4,500 different species of mammals -- and 297 of those species are in danger; 9,000 different birds -- and 359 of those species are in danger; 5,000 reptiles and 2,000 amphibians -- and 187 of those species are in danger; 23,000 different species of fish -- and 79 of those species are in danger. These figures are from the National Wildlife Federation.

But to appreciate the enormity of what is happening, one must turn from the emotion-laden fears of conservationists to the factual pages of SCIENCE magazine and a recountal by three scientists -- Peter Raven, director of the Missouri Botanical Garden; Brent Berlin, associate professor of anthropology at the University of California, Berkeley; and Dennis Breedlove, assistant curator of botany at the California Academy of Sciences in San Francisco.

In a paper entitled "The Origins of Taxonomy" (taxonomy is the science of classifying plants and animals), Raven, Berlin and Breedlove begin: "By current taxonomic standards, there are probably about 10 million species of organisms in the world, of which we have in the past 218 years described, at some level, 10 to 15 percent. For more than 99 percent of the described species, we know nothing more than a few morphological facts and one to several localities where they occur." The three scientists begin their second paragraph: "In view of the available taxonomic manpower and the enormous rate of extinction that will characterize the next century, it is doubtful that even 5 percent more of the world's organisms can be added to our inventory before the remaining 80 percent becomes extinct."

Why is this tremendous eradication taking place or imminent? The first and main reason is that one species -- ours -- is taking over the entire planet; the human presence is being felt in all but the most remote and environmentally unacceptable areas. As the human population swells -- it is 3.7 billion individuals now

and expected to push close to 7 billion by the turn of the century -- its needs grow. Not only are resources taken at an ever-increasing rate, but the demands for space are insatiable. The other species do not live in isolation; they can survive only in the conducive environment known as a habitat. As these natural environments are changed by human settlements and other human activities, many or all of the former inhabitants disappear.

So without control over the numbers of the human population and without human recognition that it is highly desirable for human welfare to maintain the earth's biotic diversity, the outlook is bleak that the impending decimation will be stayed. Few nations, if any, have set aside adequate park and wilderness areas to preserve the exotic variety that is our heritage. The one ray of hope is that increasing numbers of people are beginning to realize the importance of such preserves and, also, that some action has been taken in the most recent years to establish such protected areas.

Another way in which habitats are disturbed is through pollution, and particularly through the dispersion of chemical poisons. The permeation of the world environment with DDT and a related chemical, polychlorinated biphenyl (PCB), is by now an oft-told tale. Here, awareness has brought legislation and significant efforts at control. However, so many chemicals are used in industrial societies that purification of world environments does not appear to be in prospect.

The third important way in which some animal species are threatened is for economic reasons -- they are hunted, or poisoned because they are economic debits to some interests, or they are killed for profit. In the early years of the United States, the beaver very nearly was wiped out by trappers. The species was spared only because the beaver hat went out of style. Today, educated people see that a leopard skin coat enhances not the wearer's physical beauty but shows his spiritual squalor; it is doubtful, however, if that kind of awareness would ever spread far enough fast enough to save the spotted cats. No, another method has been employed in that campaign. The United States, for instance, passed laws forbidding the trade in many endangered feline species. So lucrative is the business, however, that such bans simply raised prices and whetted the appetites of poachers, smugglers, and criminal fur dealers. In 1971, and the first half of 1972, a major international fur-smuggling ring illegally funneled no fewer than 100,000 pelts of leopard, cheetah, ocelot, margay, otter, jaguar, and puma into the United States.

Disclosure of that ring's operations early in 1973 helped bring the agreement of the United States and 79 other nations on a convention to ban all commercial trade in 375 endangered species. The convention requires an export permit from the country of origin

and an import permit from the country of destination in order to kill or capture any member of these 375 wild species close to extinction. These species include most of the spotted cats, most crocodilians including the American alligator, a large number of birds, primates, and other mammals.

In one other recent development, the Federal Government discontinued a program euphemistically called "predator control" or poisoning coyotes and prairie dogs along with other "non-target" scavengers that happen to eat poisoned bait. This venerable poison program had long been in effect to serve sheep ranchers, and, at their determined insistence, might be (or might have been) re-instituted after this guide has been published.

Esthetics aside, what real value is it to human beings -- us and our children -- to save rare or exotic or completely dissociated species of plants and animals? Through the several million years of our species' existence, these other species may have had nothing to do with us nor we with them. How, then, could their disappearance affect us or hurt us?

Such questions can be answered by asking a few more questions. What is more lowly than a mold? To say that something is moldy is to deliver an aspersion only slightly more benign than to say it is slimy. Yet a lowly bread mold became mankind's mightiest champion. With almost a magical prowess, unheralded penicillin vanquished pneumonia, syphilis, gonorrhea, and a host of other human scourges. Yet, who of us would have mourned the passing of Penicillium notatum if that humble organism had become extinct before Alexander Fleming discovered its virtues in 1928? Which of the doomed species holds in its unique pattern of DNA the biological antidote for some future and as yet unforeseeable human scourge?

Perhaps it will be only at that eventuality when we truly appreciate that extinction is forever.

The Broadcast: THE VANISHING BREED

THE VANISHING BREED examines the problems and plight of both aquatic and terrestrial wildlife. For the aquatic story, the documentary concentrates on whales, those fascinating and little-known species of mammals that are adapted to the furthest and deepest reaches of the seas. This means that some mammals, whose ancestors left the sea environment and acquired lungs instead of gills 300 million or more years ago, for some reason reentered the oceans perhaps 100 million years ago, perhaps earlier. Perhaps these creatures were threatened in some way by an inhospitable physical environment or by predators, perhaps they found plentiful and easily captured food in the seas, or perhaps their bulk (more easily supported in water) required the return to their ancient home.

Whatever the cause, among these species evolved the largest living organism ever known to inhabit the earth -- the blue whale, 100 feet long and weighing 150 tons (that is, equivalent to a dozen elephants). Whale species even have emulated humans in the category in which they take most pride -- intelligence. The porpoise, a smaller type of whale, is believed to be the most intelligent of all creatures, excepting man. The intelligence of the porpoise caused one scientific investigator, John Lilly, to terminate his experiments because they involved what he considered intolerable manipulation and confinement of fellow sentient creatures. The song of the humpback whale has been recorded and played to symphonic audiences, documenting still another area in which these creatures emulate humans.

In more or less mythical stories, whales were said to have cooperated with men in herding schools of fish into position where they could be caught. Shipwreck survivors of our present day have reported being encircled by a ring of porpoises protecting them from sharks.

Men have reciprocated in a less friendly manner. Because of the human-cetacean relationship, a number of whale species are at the brink of extinction. Fifty years ago, there were probably some 100,000 blue whales in the deep; today, their number has been reduced to fewer than 1,000. The right whale, so named because they were "just right" for the whale hunters of the 19th century (slow swimmers that floated after being harpooned), is represented by a few dozen survivors. The humpback -- noted for its song, its playfulness, "the most gamesome and light-hearted of all the whales," Melville said -- has been reduced to a few thousand members. These species now are "protected" by international agreement among whale-hunting nations; behind this forbearance is the economic reality that individuals in these species now are too scarce to be of much value. The whale hunters, mainly the Russians and Japanese (dividing almost equally 85 percent of the catch in 1970), now go after the finback, sei, and sperm whales, and, today, both the numbers and catches in these species are dropping precipitously. During the 1960's, the yield in barrels of whale oil dwindled from more than 2 million barrels annually at the beginning of the decade to less than 400,000 barrels at the end. The numbers of finback whales dropped from an estimated 400,000 to 100,000; the sei were cut in half from 150,000; the original 600,000 sperm whales are down to about 250,000.

This self-defeating and industry-terminating reduction of whale stocks is possibly the most discouraging fact in the whole situation: not only does it testify to the human willingness to

extract an excessive short-term gain for the few in the present at the cost of long-term ruination and deprivation of those who come after, but to human inability or unwillingness to be instructed by past lessons. If the hunters had been willing to take less, say perhaps one million barrels of whale oil a year, at the beginning of the 1960's, they would both have preserved their "capital" (the numbers of whales) and maintained their level of return indefinitely. The International Whaling Commission is supposed to promote the cogency of this line of reasoning, but when it comes to exploiting a public resource, the issue so often seems to turn on who is in a position to extract a private profit. The IWC, formed in 1946 (before some of the species had become endangered), is composed of whale hunting nations and thus is somewhat in the position of the fox minding the chicken coop. In 1972, the United Nations environmental conference at Stockholm voted overwhelmingly for an end to whaling and in 1973 the IWC, goaded by aggressive United States leadership, voted some curtailment of whale hunting.

Next, the broadcast turns to Africa where a crisis of survival is looming for many species of land wildlife. Africa, of course, is in a period of transition and upheaval as many nations explore the options of self-government. To a great extent, the fate of many African wildlife species appears tied up with economics. Tourism is a big money-maker for Kenya and some other African states, so that protection and preservation of the felines, elephants and other bestial attractions would appear to be the assured course of matters. However, militating against some of the species are such economic forces as poaching -- the prices for pelts and hides keep rising with the restrictions, thus inducing illicit hunters to take greater risks.

Then, there is the competition from domestic animals, and the spread of farms and ranches interfering with wildlife habitats. With development, the human population takes and uses an ever greater percentage of the landscape. The wild inhabitants are left with less. Large-scale agriculture, of course, monopolizes big tracts of land, but scattered farms also are quite disruptive to habitats. This conflict has led some people to believe that the only way for wild species to survive is for them to earn their way economically...through game ranching. This would in effect mean controlling numbers, semi-domesticating and harvesting "crops" for a financial return.

In the broadcast, David Hopcraft expounds his belief that he can show that game ranching can be profitable. Former game warden Ian Parker, on the other hand, tried game ranching and failed. African journalist Hilary NG'weno argues that preservation of wildlife should not be based on so shakey a foundation

as tourism because some day, for any variety of reasons, tourism could fail. The animals should be saved, NG'weno says, for the meaning they bring to the lives of Africans. The savage beasts are an important part of the African heritage.

Prince Bernard of the Netherlands, makes a threefold plea: saving endangered wildlife by a more active role by governments, increasing the tempo of public education so that people better understand the value to their world and themselves of maintaining biotic diversity, and strengthening the campaigns to discourage people everywhere from trafficking in and buying the skins of endangered animal species.

What can I do?

The problem is largely one of moving on to a new level of understanding necessitated by the present ecological state of life on earth. We must, first of all, disabuse ourselves of the belief that conservation, and particularly the saving of endangered species, is some form of dewy-eyed, kindly-impulsed, laudatory "dogoodism." This quaint view may have been justified just a few years ago when the situation was less urgent, but now is obsolete.

One of the lessons of the science of ecology is that biological stability is a prime attribute of biological diversity. Biotic simplification enhances vulnerability. Sheep farmers could see the damage done to their herds by the coyotes: their reaction was to exterminate the canine. When the coyotes had almost disappeared, the rabbits multiplied in the absence of their natural control, and devastated so much grass and herbage that the ranchers lost more sheep to starvation than they had to the coyotes previously. However, this is difficult for sheep farmers to see, so many of them prefer to kill coyotes. The diverse, and hardy, forest ecosystem has gone on for 250 million years. But the single-culture agricultural crop has great trouble surviving a season without the devoted protection of the farmer with his arsenal of chemicals and labyrinths of irrigation. And so the attempt to preserve biotic diversity should be seen as hard-nosed, practical -- and extremely difficult -- efforts to protect human welfare. Do not send to know for which species the bell tolls, it tolls for ours. With each extinction, we survivors are poorer.

Ecology concentrates on the interrelatedness of individuals within a population, of populations within communities of various species, and of communities within the total environment of the ecosystem. Life can survive only within this whole context. "Since introductory biology courses usually stop abruptly with the organism," writes ecologist Eugene Odum, "and since in dealing with man and higher animals we are accustomed to think of the individual as the ultimate unit, the idea of a continuous spectrum

may seem strange at first. However, from the standpoint of interdependence, interrelations and survival, there can be no sharp break anywhere along the line."

At the same time, our culture, our religions, our historic experience have led us to believe that our species is separate and superior to all the others, that we have very little to do with them (except to eat a few of them). And this has led to the conclusion that all the rest of nature is an arrangement that exists for our exclusive benefit and disposal for whatever we see fit. Which, to carry it one stage further, has produced a colossal indifference to what is done to "nature" on the false assumption that our own destiny is not involved.

So -- the issue of wildlife and the preservation of endangered species calls for the fundamental rethinking of the human role in the spectrum of life and vis a vis the rest of nature. Hopefully, such a reexamination would lead to a more cooperative attitude to replace the present antagonistic one. Hopefully, it would assign "rights" to other species worthy to a place in the biosphere. Hopefully, it would begin to evaluate long-term biospheric integrity against short-term economic gain.

Finally, such a reevaluation should reveal that the extinction and endangerment of other species is, most of all, the result of the supersuccess of our species and our pervasive presence and influence upon the planet. Finally, the only way we can save many of these other species is to leave room for them; we must contrive to limit our own numbers and be more discriminating in the uses of our powerful technologies.

Groups listed in the Organizations part of For further information offer practical outlets to give force to new attitudes. Planned Parenthood-World Population is an organization dedicated to contain human numbers. Their publications should be evaluated. Support the World Wildlife Fund and/or the International Union for Conservation of Nature and Natural Resources in their noteworthy efforts to save natural habitats throughout the world. Support the Sierra Club and/or The Wilderness Society, for the areas they preserve are the homes of many threatened species. Support the National Wildlife Federation, the largest of the American conservation groups, so that it will have even more legislative clout when it speaks. Natural Resources Defense Council was a leader in the fight against the Federal Government's poison campaign against wild predators. That battle is far from won. The Environmental Defense Fund waged a monumental and historic fight against the use of DDT, a scourge of wildlife, and prevailed. Back these defenders. The National Audubon Society was in the anti-DDT battle from the lonely early days and today remains a stalwart protector of birds and other wildlife.

The new sensibility should make it apparent that to wear the skin of a species threatened with extinction does not make a beautiful person. Only a poorer world.

One other thing -- you can write to your favorite tuna company to ask when they are going to stop killing dolphins. It is estimated that some 250,000 dolphins are killed each year because these air-breathing mammals are caught in the nets that catch tuna and drown. This is no accident because the fishermen seek out dolphins, knowing that tuna like to swim below the air-breathing creatures.

For further information

1. LET THEM LIVE by Kai Curry-Lindahl; Morrow, N.Y., 1972, \$9.95.
A worldwide survey of animals threatened with extinction.
2. WILDLIFE IN DANGER by James Fisher, Noel Simon, Jack Vincent for The Survival Service Commission of the International Union for Conservation of Nature and Natural Resources; Viking, N.Y., 1969, \$12.95.
3. WILDLIFE CRISIS by Philip, H.R.H. The Prince, Duke of Edinburgh and James Fisher; Cowles, N.Y., 1970, \$14.95.
4. WORLD WILDLIFE: THE LAST STAND by Philip Kingsland Crowe; Scribners, N.Y., 1970, \$7.95. Details on endangered species and efforts of the World Wildlife Fund to save them.
5. AMERICA'S ENDANGERED WILDLIFE by George Laycock; Norton, N.Y., 1969, \$4.50.
6. WILDLIFE IN AMERICA by Peter Matthiessen; Viking Compass Books, N.Y., 1959, \$1.95.
7. MUST THEY DIE by Faith McNulty; Doubleday, Garden City, N.Y., 1971, \$4.95.
8. SLAUGHTER THE ANIMALS, POISON THE EARTH by Jack Olsen; Simon and Schuster, N.Y., 1971, \$6.95.
9. A MANUAL OF WILDLIFE CONSERVATION edited by Richard D. Teague; The Wildlife Society, Washington, D.C., 1971, \$5.50.
10. KING SOLOMON'S RING by Conrad Lorenz; Crowell, N.Y., \$1.95.
The classic book on animal behavior.
11. HOW ANIMALS COMMUNICATE by Bil Gilbert; Pantheon, N.Y., 1966.
A fine book that the publisher allowed to go out of print, but is carried by many libraries.

12. SILENT SPRING by Rachel Carson; Crest, N.Y., 1962, 75 cents.
13. PESTICIDES AND THE LIVING LANDSCAPE by Robert L. Rudd; University of Wisconsin, Madison, 1964, \$1.95.
14. CHEMICAL FALLOUT, edited by Morton Miller and George Berg; C.C. Thomas, Springfield, Illinois, 1969, \$22.50.
15. DIVERSITY AND STABILITY IN ECOLOGICAL SYSTEMS, report of a symposium held May 26-28, 1969 at Brookhaven National Laboratory, Upton, N.Y. Available from Clearinghouse for Federal Scientific and Technical Information, National Bureau of Standards, U.S. Department of Commerce, Springfield, Va., 22151, \$3.
16. WHERE HAVE ALL THE FLOWERS FISHES BIRDS TREES WATER & AIR GONE? WHAT ECOLOGY IS ALL ABOUT by Osborn Segerberg, Jr.; McKay, N.Y., 1971, \$2.95.
17. A SAND COUNTY ALMANAC by Aldo Leopold; Oxford, N.Y., 1966, \$6.50.
18. MAN, CULTURE, AND ANIMALS: THE ROLE OF ANIMALS IN HUMAN ECOLOGICAL ADJUSTMENT by Anthony Leeds and Andres Vayda; American Association for the Advancement of Science, Washington, D.C., 1966, \$8.
19. MAN, BEASTS, AND GODS by Gerald Carsten; Scribners, N.Y., \$8.95. A history of cruelty and kindness to animals.
20. ANIMAL ECOLOGY by Charles Elton; Methuen Ltd., London, distributed in U.S. by Barnes and Noble, N.Y., 1927, 1968, \$2.50. The pioneering work on the subject.
21. WILDLIFE BIOLOGY by Raymond F. Dasmann; Wiley, N.Y., 1964, \$7.95.
22. SAVAGE LUXURY: THE SLAUGHTER OF THE BABY SEALS by Brian Davies; Taplinger, N.Y., 1971, \$6.50.
23. THE YEAR OF THE WHALE by Victor Scheffer; Scribners, N.Y., 1969, \$1.45. One can gain an appreciation of the extraordinary creature from this exceptional account by a naturalist.
24. THE TREE WHERE MAN WAS BORN by Peter Matthiessen; THE AFRICAN EXPERIENCE by Eliot Porter; Dutton, N.Y., 1972, \$17.50. An elegant pictorial and textual report on the natural and human history of Africa.

25. THE LIFE OF THE AFRICAN PLAINS by Leslie Brown; McGraw-Hill, published in cooperation with The World Book Encyclopedia, N.Y., 1972, \$4.95. From the "Our Living World of Nature" series which has a distinguished board of consultants.
26. THE LIFE OF THE JUNGLE by Paul W. Richards; McGraw-Hill, published in cooperation with The World Book Encyclopedia, N.Y., 1970, \$4.95. From "Our Living World of Nature" series. Richards is one of the world's leading tropical ecologists.
27. THE LIFE OF THE FAR NORTH by William A. Fuller and John C. Holmes; McGraw-Hill, published in cooperation with The World Book Encyclopedia, N.Y., 1972, \$4.95. This is another in "Our Living World of Nature" series.
28. SMARTER THAN MAN? by K.E. Fichtelius; Pantheon, N.Y., 1972, \$6.95.
29. THE MIND OF THE DOLPHIN by John Lilly; Avon, N.Y., 1967, 95 cents.
30. MOBY DICK by Herman Melville; New American Library, N.Y., 1961, 75 cents.

Publications

1. FRIENDS OF THE EARTH WHALE CAMPAIGN MANUAL, obtainable from Friends of the Earth Ltd., 9, Poland St., London W1V 3DG, England, \$2. A comprehensive manual about whales, what men have been doing to them, the shortcomings and weaknesses of the International Whaling Commission, and suggestions about what can be done.
2. RARE AND ENDANGERED FISH AND WILDLIFE OF THE UNITED STATES, known as the RED BOOK, issued by the Bureau of Sport Fisheries and Wildlife of the Department of Interior. This list of rare and endangered species is kept up to date. At the end of 1970, 101 species in the United States -- 14 types of mammals, 50 birds, seven reptiles and amphibians, and 30 fish -- were in danger of extinction.
3. YEARBOOK of the World Wildlife Fund, Suite 728, 910 17th Street, N.W., Washington, D.C. 20006. The YEARBOOK lists the Fund's projects worldwide to save endangered species.

Magazines

1. NATIONAL WILDLIFE, a bimonthly magazine concentrating on the United States.
2. INTERNATIONAL WILDLIFE, a magazine for International Associate members dealing with world wildlife matters.
3. RANGER RICK'S NATURE MAGAZINE, a fine conservation-ecology-wildlife magazine for children.

All published by:
The National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036

4. AUDUBON, published by the National Audubon Society, 950 Third Ave., N.Y., N.Y. 10022.

Articles

1. "The Origins of Taxonomy" by Peter H. Raven, Brent Berlin, Dennis E. Breedlove, SCIENCE, Dec. 17, 1971. On the number of species that have been classified and the expected extinctions ahead.
2. "Endangered Species: Moving Toward a Cease-Fire" by Robert Gillette, SCIENCE, Mar. 16, 1973. On the international agreement to protect endangered species.
3. "Can Leviathan Long Endure So Wide A Chase?" by Scott McVay, NATURAL HISTORY, Jan. 1971. On the whales' last stand.
4. "Songs of the Humpback Whales" by Roger S. Payne and Scott McVay, SCIENCE, Aug. 13, 1971.
5. "DDT Proved Neither Essential Nor Safe" by Charles F. Wurster, BIOSCIENCE, Feb. 1973.
6. "DDT: An Unrecognized Source of Polychlorinated Biphenyls," SCIENCE, May 11, 1973.
7. "Death Comes to The Peregrine Falcon" by David S. Zimmerman, THE NEW YORK TIMES MAGAZINE, Aug. 9, 1970. DDT and the disappearance of the species in large parts of the United States.
8. "Last Hope for the Ospreys of Long Island Sound" by David Zimmerman, THE NEW YORK TIMES MAGAZINE, Dec. 12, 1971. One young man's attempt to save the DDT-laden ospreys by importing healthy eggs from Chesapeake Bay for them to hatch.

9. "The Last Parakeet" by George Laycock, AUDUBON, Mar. 1969.
10. "Wildlife in America" by Bil Gilbert, THE SATURDAY EVENING POST, July 1967.
11. "How Man Became a Mass Killer 11,000 Years Ago" by Walter Sullivan, THE NEW YORK TIMES, Mar. 22, 1970.

Films*

1. SAY GOODBYE, 52 min., color, purchase from Films Inc. \$500, rental \$25, produced in 1970 by David Wolper. We already have said goodbye to some 165 species in the past 50 years, and will bid farewell to many more unless we learn to share the earth. Jr. high school to adult.
2. ATONEMENT, 52 min., color, produced by the National Film Board of Canada, purchase from Films Inc. \$500, rental \$25. A film about efforts to save endangered species.
3. OUR ENDANGERED WILDLIFE, 51 min., color, purchase from Contemporary \$575, rental \$35, produced in 1968 by NBC News. A catalog of endangered species in the United States and measures being employed to save them. Jr. high school to adult.
4. DEATH OF A LEGEND, 50 min., color, purchase from National Film Board of Canada \$550, rental \$30. A highly praised film about unrelenting human hostility toward the wolf. Jr. high school to adult.
5. THE AMERICAN BALD EAGLE, 16 min., color and b & w, purchase from Coronet \$195 for color, \$97.50 for b & w, produced in 1971. Hunters, land development, and pesticides are the culprits in this story of decline and fall. Suitable for grades 4 to adult.
6. JOURNEY INTO SUMMER, 51 min., color, purchase from Xerox Films \$575, produced in 1970. Film documents present state of North American wilderness and what has happened to its wildlife inhabitants. Jr. high school to adult.
7. PRAIRIE KILLERS, 30 min., color, purchase from Indiana University \$315, rental \$11.50, produced in 1970. A chronicle of the slaughter of the wildlife on the Great Plains. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

8. THE GRIZZLY BEAR -- A CASE STUDY IN FIELD RESEARCH, 22 min., color, purchase from Films Inc. \$265, rental \$14, produced in 1967. Jr. high school to adult.
9. WHITE SPLENDOR, 11 min., color, purchase from Pictura Films \$100, rental \$10, produced in 1968. The story of the depredations against the American egret. Jr. high school to adult.
10. VANISHING BIRDS, 11 min., color, purchase from Pictura Films \$100, rental \$10, produced in 1968. The story of the disappearing California condor. Jr. high school to adult.
11. THE LOSERS, 30 min., color, purchase from Time-Life Films \$300, rental \$30. A film speculating on whether the horse will be committed to the evolutionary junkyard now that men have turned to machines. Jr. high school to adult.
12. ANIMALS OF AFRICA, 14 min., color, purchase from Contemporary \$210, rental \$15, produced in 1968 by ABC News. Endangered species on the Serengeti plain. Jr. high school to adult.

Phonograph Records

1. SONGS OF THE HUMPBACK WHALE
Capitol Records ST - 620
\$5.98
(The recorded singing of the whale.)

Organizations

1. World Wildlife Fund
1110 Morges
Switzerland (International Headquarters)

Suite 728
910 Seventeenth St., N.W.
Washington, D.C. 20006 (United States Headquarters)
(Emphasis on preservation of habitats.)
2. International Union for Conservation of Nature and Natural Resources
1110 Morges
Switzerland
(An independent international body whose membership includes governments, governmental departments, international organizations, and private institutions. Promotes and supports actions to preserve the diversity of natural environments.)

3. National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036
4. National Audubon Society
950 Third Avenue
New York, N.Y. 10022
5. Sierra Club
1050 Mills Tower
San Francisco, Calif. 94104
6. Friends of the Earth
529 Commercial St.
San Francisco, Calif. 94111
7. The Wilderness Society
729 15th St., N.W.
Washington, D.C. 20005
8. Environmental Defense Fund, Inc.
162 Old Town Road
East Setauket, N.Y. 11733
9. Natural Resources Defense Council
15 West 44 Street
New York, N.Y. 10036
10. Planned Parenthood-World Population
810 Seventh Ave.
New York, N.Y. 10019
11. Ducks Unlimited, Inc.
P.O. Box 66300
Chicago, Ill. 60666
(Buys, restores, maintains wetlands for ducks breeding grounds.)
12. Defenders of Wildlife
2000 N Street, N.W.
Washington, D.C. 20036
13. The Wildlife Society
Suite S-176
3900 Wisconsin Ave., N.W.
Washington, D.C. 20016
(For professionals, disseminates advanced-level information.)

14. Wildlife Management Institute
709 Wire Building
Washington, D.C. 20005
(For more technical materials.)
15. Friends of Animals, Inc.
11 West 60th St.
New York, N.Y. 10023
(With accent on anticruelty.)
16. African Wildlife Leadership Foundation, Inc.
1717 Massachusetts Ave., N.W.
Washington, D.C. 20036
(Trains Africans in wildlife management and helps maintain preserves in Africa.)
17. Project Jonah
1300 Sansome
San Francisco, Calif. 94111
(This organization is devoted to saving the remaining whales and dolphins.)

Government Agencies

1. Bureau of Sport Fisheries and Wildlife
Washington, D.C. 20240
(Aids in conservation of migratory birds, certain mammals, and sport and commercial fishes.)
2. House Committee on Merchant Marine and Fisheries
Subcommittee on Fisheries and Wildlife Conservation
Room 1334
Longworth House Office Building
Washington, D.C. 20515
3. Office of Pesticide Programs
Environmental Protection Agency
U.S. Waterside Mall
Washington, D.C. 20460
4. New York State Department of Environmental Conservation
50 Wolf Rd.
Albany, N.Y. 12201
(Of course, each state has its own counterpart.)
5. International Whaling Commission
Great Westminster House
Horseferry Road
London, S.W. 1, England
6. National Marine Fisheries Service
3300 Whitehaven Parkway
Washington, D.C. 20240

**NOR
ANY DROP
TO DRINK**



NOR ANY DROP TO DRINK

Perspective

The earth was formed out of a congealing band of hydrogen, water, ammonia, methane, silicon, iron, and other frozen elements circling the Sun some 4.5 billion years ago. Within a half a billion years -- about 4 billion years ago -- the primordial seas came into being. In the next half to 1 billion years, the ongoing chemical evolution crossed a threshold and life appeared in the matrix waters. It was to be confined there for the next 2.5 to 3 billion years before plants and amphibians ventured onto land.

Water is the precondition, the basic prerequisite, and the main component of life. Seventy percent of the human body is composed of water. Seventy percent of the earth's surface is covered by water, which is why it appears to observers in space that the Earth is the blue planet. However, less than one percent of this abundant water is available to man as drinking water or as fresh water to irrigate agricultural lands and slake the thirst of industry. The abundant sea water simply is too salty to sustain life, agriculture, or industrial processes.

Only .009 percent of the world's water is cupped in freshwater lakes; an even smaller amount of nonealine water is contained in the world's rivers. Most usable water comes from groundwater. There is a huge reservoir of freshwater--three times the amount available from the other land sources -- in the polar ice caps, most of it deposited in Antarctica, with the remaining 10 percent in the arctic and Greenland. This water, however, is essentially unavailable, at least by today's technology.

The fresh water that is available is distributed quite unevenly throughout the world. More than one-third of all fresh water, for example, is in Canada and the Soviet Union, two countries with low population densities. At the same time, demands for clean water are skyrocketing almost everywhere. One reason for this is that the human population is growing at a rate of nearly 100 million people a year. But, surprisingly, the drinking water needs of these "new" people is not the big problem. India, with the world's second largest population -- 530 million people -- allocates only 3 percent of its water resources to municipal and rural water supplies. Nearly all of India's water supply (96 percent) goes to irrigation and other agricultural needs in order to feed those people. In a recent year, India drove more than 78,000 new wells. This may help

India's food balance, but it means an ever-growing withdrawal from that nation's water capital, and no one is quite sure what that means for India's future. By the end of this century, it is expected that India will be using virtually every drop of its available water.

The industrialized United States, with a population less than 40 percent the size of India's, uses half again as much water as India. About one half of this water goes for industrial purposes, with another 40 percent used for agriculture and only 10 percent siphoned into municipal and rural drinking supplies. In the United Kingdom which does not have much room for agriculture, two-thirds of the water resources serves industry; 80 percent of the Netherlands' fresh water is funneled into industrial output. Where India consumes 600 cubic meters of water per person a year (compared to 36 cubic meters in Tanzania, 200 cubic meters in the United Kingdom, and 630 cubic meters in Israel,) the Soviet Union uses 1,000 cubic meters while the rate in the United States is 2,300 cubic meters.

Here are some agricultural and industrial reasons why:

It takes 190 liters (one liter equals 1.05 quarts) of water to produce a single corn plant, 1,700 liters of water to produce a kilogram (1,000 grams or about 2.2 pounds) of rice, 4,200 liters of water to produce 2.2 pounds of milk, 22,000 liters of water to produce 2.2 pounds of meat. It takes 2,200 liters of water to manufacture one ton of bricks, 165,000 liters of water to make a ton of steel, 380,000 liters of water to manufacture one automobile, more than 1.3 million liters of water to produce one ton of plastic. In industrialized societies, industry now requires 6,000 liters of water a day to produce the goods and services for each citizen. While population and industrialization -- and thus demand -- have been soaring, even the relatively limited supply of usable water has been reduced by pollution from growing industrial and agricultural processes as well as human waste.

Because of the expected growing demands for water in the years immediately ahead, clean water is the one natural resource that United Nations experts fear may come into critically short supply in the foreseeable future. Of course, shortages undoubtedly will appear unevenly. These shortages will have to be met by curtailing industrial and population growth, by providing water from more distant places, and by recycling through improved technological means. Certainly, recycling of water will have to become far more intensive than is practiced today. This means that the esthetic ideal of greater water purity will become relentless necessity, forcing greater control of human and other wastes dumped into water courses, and better, more widespread purification facilities.

It also means that the pressures of growing demand and shrinking supply will turn clean water from one of nature's "freebies" into a precious economic commodity. "There is one particular point to be considered," a United Nations report* states, "if the question of an eventual global water shortage is raised with regard to long-range demand projections, namely the potential for desalination. As the United Nations desalination survey indicates, economic and social development have necessitated the use of desalinated sea-water as the basic or supplementary source of water at several locations in the arid zone. In Israel, Kuwait, and the United States of America and several other countries, extensive research and experimentation is under way aiming at the step-by-step decrease of the specific costs of producing fresh water by utilizing the principal desalination technologies." "Within the next century, desalination may be expected to become the basic source of large-scale (regional and national) water-supply in several countries of the arid zone. It may well be, however, that the costs of supplying fresh water and of disposing of waste water will constitute, at that time, a much higher percentage of national budgets."

Poor water quality is virtually an emblem and one of the heaviest burdens of the poor, underdeveloped, underprivileged nations. Waterborne disease -- cholera, schistosomiasis, dysentery, filariasis, and others -- sap the vitality of nearly one in seven persons in the developing nations. A World Health Organization survey of community water supply programs in 88 developing nations with more than 1.6 billion people shows that from about 75 to nearly 90 percent of these people are exposed to unsafe drinking water.

Even in the United States, where clean, safe drinking water is taken for granted, such an assumption disagrees with the facts in a surprisingly large number of places. In 1969, the U.S. Public Health Service's Bureau of Water Hygiene (since transferred to the Environmental Protection Agency) conducted the first extensive survey of water systems in the nation's history; the supplies examined serve 18 million people, more than 10 percent of the nation's water customers. The survey inspected 969 (out of some 35,000) public water systems, including the entire state of Vermont and eight urban areas: New York City; Charleston, West Virginia; Charleston, South Carolina; Cincinnati; Kansas City, Missouri (and Kansas); New Orleans; Pueblo, Colorado; San Bernadino-Riverside-Ontario, California.

*Economic and Social Council Committee on Natural Resources E/C.7/40/Add.3, 5 December 1972. "Projections of Natural Resources Reserves, Supply and Future Demand, Note by the Secretary-General, Projections of Reserves, Supplies and Future Demand For Water Resources."

About 15.5 million of these Americans, or 86 percent, were drinking good quality water. But nearly 400 of the supply systems were delivering substandard water to 2.5 million people. If the findings of the 1969 sample are extrapolated to the entire United States, it means that probably 23 million Americans drink substandard water, 8 million get what Federal officials call "potentially dangerous" water, some half a million Americans are supplied water that the Federal Government has banned from interstate commerce (one of the few Federal drinking water jurisdictions) as hazardous. As of April 17, 1973, the EPA said that the drinking water of such cities as Miami Beach; Asheville, N.C.; Gulfport, Miss.; Quincy and Haverhill, Mass. were not fit for use and thus banned from interstate carriers. Of course, the EPA did not have the authority to prevent those communities from offering such low-quality water to their own citizens.

The main reason for dirty drinking water is economic. Federal experts say that states should spend 20 cents per person a year to man and run a fully adequate supply system. Even the best state, New Hampshire, in 1970 spent only 18 cents per capita while such states as New Jersey and Connecticut spent only 2.2 cents and 1.7 cents respectively. The average was 6.3 cents (the figure for New York State was 8.9 cents).

Only 15 states explicitly adhere to the U.S. Public Health Service's drinking water standards, seven others follow them with some modifications (this group includes New York State which permits a higher amount of manganese and does not require as many bacteriological test samples). In essence, the PHS drinking water criteria are as follows: Polluted water sources to be used only with dependable purification facilities. Regular laboratory testing of distributed water with 90 percent of each month's samples free from coliform bacteria. Limits on turbidity, color, odor, radioactivity, total dissolved solids, and the following chemical or other contaminants: arsenic, chloride, copper, carbon chloroform, extract, cyanide, fluoride, iron, manganese, nitrate, phenols, sulfate, zinc, alkyl benzene sulfonate.

One reason for purification and close inspection of the water supply for some 65 million Americans is that the water they drink came only hours before from an industrial or municipal sewer. For these Americans, recycling is hardly an environmentalist's shibboleth; it is a fact of life.

The broadcast: NOR ANY DROP TO DRINK

California is bountifully and beautifully endowed with most of nature's treasures. However, one vital ingredient is in short supply: good quality fresh water. That fact has led to an elaborate system of aqueducts, canals, irrigation systems, and threatens groundwater tables, inspiring even more grandiose schemes to bring still more water to thirsty Southern California.

A few proposed solutions: Two staff members of the Rand Corporation think tank at Santa Monica have suggested towing from Antarctica, where the major portion of the Earth's fresh water is stored as ice and frozen snow, huge icebergs. Another method, which actually did go into operation, was located at San Diego in the form of a Department of Interior plant to convert sea water into fresh water. This would seem to be the way to the greatest returns, for the oceans contain most of the planet's supply of water. However, while the salt-to-fresh-water conversion can be done, it is not economically realistic at this point in history. In 20 years of experimentation, the cost of desalinizing one cubic meter of water has come down from 1.06 to 33 cents. However, that cost still is about 10 times too expensive for common use. And so the San Diego operation was phased out of existence under the general economy campaign undertaken by the Nixon Administration. The broadcast looks at still a third experimental source of fresh water, the geothermal desalinization plant in the Imperial Valley. Not only does this plant produce or harness heat from subterranean sources, but it turns deep-level brine into usable water.

Some day, in the not too remote future, one or all of these methods may be routine in the United States, for at the rate that Americans' demands for water are growing, needs will exceed supply within 50 years.

Mexico City is a good example of the human population's -- civilization's -- seemingly unquenchable thirst. Where the Mexican capital now stands, there was once a lake. After the conquest of the Aztecs, the Spaniards filled in the lake. As the city grew, more and more wells were dug; as ever greater amounts of groundwater were withdrawn, the subsoil was squeezed dry like a sponge. The sponge lost its resiliency, and Mexico began to sink, for a while at the rate of 20 inches a year. Today, the city still subsides about three inches annually, causing buildings to tilt and crack. But that is not the biggest worry. The city must seek groundwater in ever-widening circles from the city's heart. Even as these peripheral sources are drawn upon to water the city, the urban organism spreads out on the surface to overrun these areas -- so that the water foraging must extend still farther. How far, and how long, this process can go on is uncertain; what is certain is that it cannot continue indefinitely.

New Orleans, on the other hand, has an unlimited supply of non-saline water provided by the Father of Waters, the Mississippi River. The problem here is not quantity, but quality. The water that issues from a tap in New Orleans has been through at least five toilets or household/industrial systems on its way down the great natural conduit of North America. Unappealing as that may be esthetically, such contamination and

its threats to human health is eliminated by the purification plants of New Orleans and a dozen other cities below Baton Rouge that depend entirely upon Mississippi River water.

However, in recent years the drinking supply has been tainted and threatened by a new kind of pollution. The situation was spelled out in a report* in April 1972 by the Environmental Protection Agency: "The deterioration of the water quality in the river closely paralleled the explosive development of a petrochemical industrial complex which began in the middle 1950's and which by the end of the 1960's had resulted in the location of over 60 major industries from Baton Rouge to the mouth of the river. Most of the industries discharged their partially treated or untreated wastes to the river." "Municipal water supplies were found to contain organic compounds in trace amounts which are believed to be the cause of the off-flavors in these supplies, and which may present a potential threat to the health and well-being of the consumers."

However, as a result of the information development by the EPA investigation as well as by enforcement by EPA of the new Refuse Act Permit Program, there has been a drop in some of these industrial wastes and even greater reductions in these chemical discharges is expected in the years immediately ahead.

This story is headed toward a happy ending.

What can I do?

It is heartening to report that you and/or millions of your fellow citizens already have done a great deal in the past few years -- by acting in the most effective way possible in democracy, that is by making it unmistakably clear to representatives at all levels of government that we, the people, want nothing less than clean water throughout the United States. The Congress has responded with a huge multibillion dollar anti-water pollution program. Twice, the voters in New York State have approved bond issues to cleanse the Hudson River and other water courses. In the spring of 1973, there was also encouraging news on that waterfront. Commercial fishing for shad, which had just about disappeared because oil pollution changed the taste of the fish, showed a spurt of activity. And fisherman Harry Lyons, who had caught Hudson River shad for most of his 89 years, reported seeing clams on the Jersey shore off New York City for the first time in 50 years. The river still is too polluted for the clams to be edible, and they are very small -- "only about as big as your thumbnail," Mr. Lyons said, "but they're a pretty sight."

The lesson is plain. It can be done. But the doing requires constant attention and pressure. The goal of clean waters has not yet been achieved, and in order to reach it, citizens will have to continue to make their desires felt. This is so because water purity is attained at a direct cost to some industry or municipality: either can find many other uses for

*INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA
(See Publications.)

that money. Ultimately, though, the costs are passed on to the consumers and taxpayers, so that it is only right that we, the people, set the priorities.

For more specifics, see the What can I do? section of FLOW GENTLY.

Another kind of issue is raised in contemplating the subject of usable water, and that is the complex question of the limits to growth. If demand for water in the United States will exceed supply in half a century, it would appear that water is a limiting factor to industrial and agricultural growth. The question is: Should we simply go along with this expansion in demands until nature takes its confining course (and we all become uncomfortable with the restrictions) or should we begin thinking now about controlling the growth of water needs? Must every rivulet serve some financial purpose, must we dam and throttle every last watercourse before we are forced to desist economic expansion? Will wild river, white water, virgin waters be far too costly a luxury for this "affluent" society of the future?

Of course, we would always be able to procure additional water from the seas through desalinization plants. However, this process would require even more of our treasure and effort to meet an unceasing demand, so that in order to grow richer we would become poorer until we were overtaken by the law of diminishing returns. The entire discussion in THE LIMITS TO GROWTH is particularly pertinent from the aspect of this essential and crucial resource: clean fresh water.

Finally, it is worth remembering that the title for this broadcast is taken from "The Rime of the Ancient Mariner" by the early Romantic period poet, Samuel Taylor Coleridge:

"Water, water, everywhere,
And all the boards did shrink;
Water, water, everywhere,
Nor any drop to drink."

Water has many uses. It floats ships, carries away waste, cools steel, washes tools, makes cement, and sustains life.

For further information

Books

1. ENVIRONMENTAL GEOSCIENCE by A.N. Strahler and A.H. Strahler; Hamilton Publishing, Santa Barbara, Calif., 1973, \$12.95. Expounds the basis of the earth's water system -- water table, rivers, glaciers -- as related to man's environment and what he does to it; this is well diagrammed in chapters 5, 11-17.

2. HEALTH HAZARDS OF THE HUMAN ENVIRONMENT, prepared by 100 specialists in 15 countries and published by the World Health Organization, Geneva, 1972, \$11. This extensive compendium, which contains sections on water and community water supplies, may be purchased from the United Nations Bookshop, New York, N.Y. 10017; The American Public Health Association, Inc., 1015 18th Street N.W., Washington, D.C. 20036; and in 65 other countries.
3. THE CARELESS TECHNOLOGY: ECOLOGY AND INTERNATIONAL DEVELOPMENT, edited by M. Taghi Farvar and John P. Milton, Natural History Press, Garden City, N.Y., 1972, \$25. About 230 pages of this book are devoted to "Irrigation and Water Development."
4. WATER AND LIFE by Lorus and Margery Milne; Atheneum, N.Y., 1964, \$5.75.
5. THE WATER HUSTLERS by Robert Boyle, John Graves, and T. H. Watkins; A Sierra Club publication, San Francisco, 1972, \$7.95.
6. THE COMING WATER FAMINE by (Congressman) Jim Wright (of Texas); Coward-McCann, N.Y., 1966, \$6.95.
7. WATER IN THE MODERN WORLD: SOLUTIONS TO A PROBLEM OF SUPPLY AND DEMAND by Michael Overman; Doubleday (Science Series), Garden City, N.Y., 1969, \$2.45.
8. WATER SUPPLY: ECONOMICS, TECHNOLOGY AND POLICY by Jack Hirshleifer; University of Chicago Press, 1969, \$10.
9. THE WATER WE LIVE BY: HOW TO MANAGE IT WISELY by L.A. Hiendle; Coward-McCann, N.Y., 1970, \$4.29.
10. STRATEGIES OF AMERICAN WATER MANAGEMENT by Gilbert F. White; University of Michigan Press, Ann Arbor, 1969, \$5.95.
11. WATER, HEALTH, AND SOCIETY: SELECTED PAPERS, edited by Abel Wolman; Indiana University, Bloomington, 1969, \$15.
12. THE FRESH WATER OF NEW YORK STATE: ITS CONSERVATION AND USE, edited by Lauren B. Hitchcock; William C. Brown Co., 1967, \$5.

13. THE ORSANCO STORY: WATER QUALITY MANAGEMENT IN THE OHIO VALLEY UNDER AN INTERSTATE COMPACT by Edward J. Cleary for Resources For The Future, Inc.; Johns Hopkins Press, Baltimore, 1967, \$2.95.
14. WATER MANAGEMENT INNOVATIONS IN ENGLAND by Lyle E. Craine for Resources For The Future, Inc.; Johns Hopkins Press, Baltimore, 1969, \$3.50.
15. ECONOMICS OF REGIONAL WATER QUALITY MANAGEMENT by Allen Knees for Resources For The Future; Johns Hopkins Press, Baltimore, 1964, \$5.
16. CALIFORNIA WATER: A STUDY OF RESOURCE MANAGEMENT, edited by David Seckler; University of California Press, Berkeley, 1971, \$15.

Publications

1. PROJECTIONS OF NATURAL RESOURCES RESERVES, SUPPLY AND FUTURE DEMAND: PROJECTIONS OF RESERVES, SUPPLIES AND FUTURE DEMAND FOR WATER RESOURCES, United Nations Economic and Social Council, Committee on Natural Resources, Dec. 5, 1972, E/C.7/40/Add.3.
2. INDUSTRIAL POLLUTION OF THE LOWER MISSISSIPPI RIVER IN LOUISIANA by the Surveillance and Analysis Division of the Environmental Protection Agency, Region VI, Dallas, Texas, April 1972. The report pinpoints chemical pollution, beginning in the mid-1950's as the major culprit.
3. COMMUNITY WATER SUPPLY STUDY, NEW ORLEANS, LOUISIANA by the Environmental Health Service of the Public Health Service, August 1970. This is one part of the substantial survey of drinking water in the United States carried out by PHS. The foreward of the study states in part: "This particular report defines problems in each water system, points up the underlying causes for the existence of these problems and recommends solutions to the causes...Hopefully, this report will serve as a call to arms for all those concerned with annihilation of the underlying causes that permitted these conditions to develop."
4. WHAT IS WATER?, 1 19.2:W 29/17/1972 S/N 2401-02193, U.S. Government Printing Office, Washington, D.C. 20402, 10 cents. Discusses chemical composition of water and its various forms.

5. NEW WATER, a booklet prepared by the Office of Saline Water in the Department of the Interior to provide general information on the history, activities, and objectives of the program to convert salt water to fresh water. It may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for 60 cents.
6. SALINE WATER CONVERSION SUMMARY REPORT, 1971-1972 by the Office of Saline Water, Interior Department, \$1 from Superintendent of Documents.
7. THE A-B SEAS OF DESALTING by the Office of Saline Water, Interior Department, 35 cents from Superintendent of Documents.
8. THE SAN DIEGO TEST FACILITY by the Office of Saline Water, Interior Department, 45 cents from Superintendent of Documents.
9. GEOTHERMAL RESOURCE INVESTIGATIONS IMPERIAL VALLEY, CALIFORNIA: DEVELOPMENTAL CONCEPTS by the Bureau of Reclamation, Department of the Interior, Jan. 1972.
10. INVESTIGATION OF GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY AND THEIR POTENTIAL VALUE FOR DESALINIZATION OF WATER AND ELECTRICITY PRODUCTION by Tevi Meidav and Robert W. Rex, The Institute of Geophysics and Planetary Physics, University of California, Riverside, July 1970.

Magazines

1. CURRENT REVIEW OF WATER RESOURCES, published irregularly by the League of Women Voters, 1200 17 St., N.W., Washington, D.C. 20036, 50 cents.
2. DESALINIZATION, published quarterly by Elsevier Publishing Co., Box 211, Amsterdam, Netherlands, \$25.
3. DESALTING DIGEST, published by Industry Reports, Inc., 514 10th St., NW, Washington, D.C. 20004, \$15.

Articles

1. "Impure Tap Water a Growing Hazard to the Health of Millions Across U.S." by Gladwin Hill, THE NEW YORK TIMES, May 13, 1973.

2. "Drinking Water" by Janice Crossland and Virginia Brodine, ENVIRONMENT, April 1973. On the Public Health Service study of U.S. drinking water supplies.
3. "A Cleaner Hudson Keeps Shad Fisherman Busy" by David Bird, THE NEW YORK TIMES, April 28, 1973.
4. "Court Orders U.S. to Release Funds for Clean Water," Page 1, THE NEW YORK TIMES, May 9, 1973.
5. "Purification of the Nation's Waters Expected to be Long and Costly" by Gladwin Hill, THE NEW YORK TIMES, March 17, 1970.
6. "The Mississippi: Highway of Pollution" by Roy Reed, THE NEW YORK TIMES, Dec. 8, 1971.
7. "New Orleans and Her River" by Joseph Judge, NATIONAL GEOGRAPHIC, Feb. 1971.

Films*

1. ELEMENT THREE, 46 min., color, purchase from International Film Bureau \$450, rental \$25. Film shows man's need for water from the beginning of civilization to the present and urges positive action to preserve water resources.
2. AQUA FOLLY, 29 min., color, no charge for loan from Boyd Film Company. Film discusses growing national water problem and illustrates proper water management and its use in soil, forestry, and wildlife conservation.
3. WATER RESOURCEFULNESS, 20 min., color, purchase from Stuart Finley \$200, rent \$20. The film discusses New York State's programs and plans for an adequate water supply.
4. WILD RIVER, 13 min., color, purchase from Encyclopedia Britannica \$150, rental \$9. The role of wild rivers in our water supply.
5. THE YEAR OF DISASTER, 25 min., color, may be borrowed free of charge from Modern Talking Picture. Film discusses how a community water management program can help prevent a year of disaster.
6. WATER: PATTERN OF LIFE, 28 min., color, free loan from Ohio Department of Natural Resources. Film discusses problems of water management.
7. NEW WATER FOR A THIRSTY WORLD, 22 min., color, no charge for loan from Film Management Center. A film about conversion of sea water to usable fresh water.

*Address of film distributors are given at the end of this guide.

8. DESALTING THE SEAS, 17 min., color, Atomic Energy Commission. Describes various methods of purifying saline waters through use of nuclear energy.

Government Agencies

1. World Health Organization
20 Avenue Appia
1211 Geneva Switzerland
2. Water Supply Division
Environmental Protection Agency
U.S. Waterside Mall
Washington, D.C. 20460
3. Department of Environmental Conservation
50 Wolf Road
Albany, N.Y. 12201
4. Department of Health
84 Holland Avenue
Albany, N.Y.
5. Geological Survey
18th and F Streets, N.W.
Washington, D.C. 20242
(Conducts research into water resources.)
6. National Water Commission
Quincy Street
Arlington, Virginia 22203
(Reviews present and anticipated water resource problems and alternatives.)
7. Office of Water Resources Research
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20204
(Research, training, and information exchange in water resources.)
8. Bureau of Reclamation
Department of the Interior
Washington, D.C. 20240
(Administers Federal program in western states for water resource development.)
9. Office of Saline Water Information Program
Department of the Interior
18th and C. Streets, N.W.
Washington, D.C. 20240

**THROUGH
THE MILL
ONCE MORE**



THROUGH THE MILL ONCE MORE

Perspective

One of the great lessons that the science of ecology teaches is the cyclic nature of life. The fuel of life is energy, specifically, that portion of energy radiating from the sun which is captured by green plants and converted into chemical energy. This photosynthetic conversion is the basis for life on earth -- it is the only form of energy that biological organisms can utilize directly, it is the "food" that sustains all creatures. All other meaningful forms of energy on earth also have emanated from the sun (coal, which once was vegetation; falling water, which is lifted to the heights again by evaporation; winds, which are produced by solar warmth) except that which is released by the fission and fusion of atoms.

The energy cycle is open, parabolic. There is a continual stream from the sun, and just as much goes back out into space so that the energy content on earth remains constant. An extremely small percentage of the total solar energy striking the earth is fixed by green plants; nevertheless, that relatively tiny amount is used by many organisms on the way up the food chain before the energy finally is dissipated (in obedience to the second law of thermodynamics, some energy is "lost;" that is, degraded or spread around in a less concentrated form usually as waste heat, with each transaction or exchange). Under this arrangement it is obvious that we are dependent on a steady input from the sun or the stream of energy soon would run out, and with it, all life on earth. Except for a relatively tiny fraction of nuclear energy, all the energy that grows our food, vitalizes us, powers the life cycles, moves our vehicles and machines (fossil fuels are energy from the sun in past ages stored as coal, oil; etc.) comes from the sun.

The materials of life, on the other hand, do not escape from the earth. They are locked into a closed system, endlessly recirculating through what ecologists call biogeochemical cycles. The atoms of hydrogen and oxygen as water, the carbon, nitrogen, calcium, boron and other elements that compose our bodies at other moments in the eons of time will exist in other combinations and in other conditions -- perhaps for much longer periods in inanimate gaseous states or sediments. The home for most nitrogen is the atmosphere; this element must be changed by microscopic organisms in order to serve in the life cycle.

While these elemental atoms cannot get away from the planet, they are not always or necessarily accessible to life forms. Nitrogen is continually becoming embedded in deep ocean sediments and thus for all practical purposes lost to us. Fortunately, the

nitrogen supply is regularly replenished by an equal amount from volcanic gases. In the case of phosphorus, which also is being lost to the deep ocean sediments, there is no compensating infusion. We must keep mining our finite supplies of phosphate rock. And while, right now, phosphates seem to have been the particular concern of people in the detergent and fertilizer business, ecologists fear that exhaustion and/or disappearance of phosphate will become the first limiting resource factor of life on earth.

The human species has grown and prospered in virtually complete ignorance of and total disregard for the great ecological cycles in which life pulses. But because the species has grown and prospered, because the human impact upon environment has swelled to such a degree, we are being forced to recognize and consider these cycles. As we continually use more energy, the problem of waste heat grows ever more insistent, making urban summers more intolerable, distorting the weather and even the climate of metropolitan areas, and posing hazards for our high-energy future. Because of those biogeochemical cycles and because of our unwary, indiscriminate use of all sorts of materials, we now carry strontium 90 in our bones, soot and asbestos in our lungs, lead in our blood, DDT in our fat and even in mother's milk.

Man is affecting the ecological cycles in quite another way, and that is by taking and manipulating an increasing fraction of the earth's elements into forms and products that serve only his immediate purposes. Human beings, going back to the evolution of our hominid ancestors some 2 or 3 million years ago, have been interested in utensils only as long as they served his needs, naturally, enough. Banana skins, nut shells, broken spears were tossed away. Refuse heaps are always a telltale clue to prehistoric human settlements. Natural cycles were hardly affected by these early disruptions because (a) they occurred on such a small scale, and (b) only natural and usually organic products were being used: they could be recycled readily by nature.

Today, however, hosts of synthetic -- or unnatural -- artifacts are being produced, employed, and then thrown away or distributed in other ways into the environment. There has not been time in the slow scale of evolution for the emergence of organisms that eat or otherwise break down plastics. Aluminum is a natural enough element, but it is not disposed to combine easily with oxygen, and so a discarded aluminum can is almost imperishable in terms of our time scale. Iron, on the other hand, readily oxidizes -- rusts -- which means that this metal which is so useful in its concentrated form becomes dispersed as minute particles. While the iron still remains within planetary bounds, it is essentially lost to human use.

The most visible way in which the disruption of cycles has been forced upon the attention of contemporary people is through so-called "waste." Each year, more than 200 million tons of solid wastes are collected in the United States. Each year, Americans spend more than \$5 billion in largely unsatisfactory attempts to dispose of that waste. Burning of refuse is undesirable because of air pollution. Dumping garbage and raw sewage into waterways is "verboden" because of water pollution. And the practice of dumping on land is becoming an unacceptable alternative because land now is too desirable and valuable for such a purpose.

So, what to do? The time-honored human custom of the ostrich reaction to refuse has become untenable. In desperation, society has begun to turn to the model of nature as a way to level the mountains of junk, trash, garbage, human and municipal waste. In several words -- reuse, recycle, convert, transform. In this context, reuse means to use again a whole product which was meant for a single use, such as a nonreturnable bottle. Recycle means separating and/or reusing material components in a product to make similar or other products. Conversion means the recovery of energy from discarded products. Transformation means using chemical treatment to yield new by-products.

Reuse (and prolonged use) of a product is the most economical method. Returnable bottles are cheaper in dollars and they also conserve energy resources far better than throwaways, even when the best recycling technology is used. Bottlers and manufacturers who urge recycling glass as good citizens, but insist on using nonreturnable containers, therefore, are hypocritical. Certain products cannot be reused, of course. Newsprint must be recycled. But the enormous saving in trees that can be -- that already is being -- accomplished can be appreciated by the fact that more than 11 million tons of paper stock are collected, processed and recycled in the United States today. This means the conservation of 200 million trees. However, perhaps 90 percent of the paper in the United State is recoverable, and four times as many more trees could be conserved.

When it comes to metals in increasingly short supply -- copper, for instance -- the percentage of waste being recycled and reused is becoming surprisingly high. More than 60 percent for copper. Still, that leaves another 40 percent -- about 1 million tons a year in the United States -- that is being wasted. With silver and other precious metals, 75 percent is recovered from discarded products.

And this points out one of the key lessons as we move into the era of recycling. It isn't simply a matter of collecting and reprocessing. The technology exists for recovering and

recycling practically all forms of solid wastes for which there are markets. The key part of the equation is the value of the material -- how attractive is the market for it. A very important part of the readjustment is to make sure that the substance which is being recycled has a place to go. And that means economically as well as physically.

The Broadcast: THROUGH THE MILL ONCE MORE

Perhaps a subtitle for this broadcast could be the old adage, "Waste not, want not." We see visible signs of the waste-resource dilemma: mountains of trash beside chasms where ore has been mined or scars where coal has been stripped. This illustrates the beginning and the end in the one-way route of so many of our resources (a resource being any material for which humans find or assign a use).

There is great emphasis today on using virgin material; after all, that is the traditional way to do things. And so, poor countries like Turkey and Zambia are eager to mine and export one of their mineral treasures, copper, in exchange for the money which can pay for the many things underdeveloped countries need. However, this is a one-way route, too, depleting the natural stocks of the poorer countries and diminishing the patrimony of their posterity. In many cases, it is cheaper to use virgin materials, and, naturally, manufacturers prefer them in such cases. Thus, custom, inertia, costs, and even discriminatory freight rates militate against recycling and using recycled materials.

Not thinking in terms of recycling, having been unaccustomed to it resulted in an even more practical obstacle: the absence of technology, a dearth of good, efficient ways to recycle. However, this hurdle no longer really exists -- what persists is widespread ignorance of the fact that the day of recycling technology has dawned. THROUGH THE MILL ONCE MORE takes a look at some recycling processes now in operation.

The Garden State Paper Company in New Jersey recycles old newspapers into fresh newsprint. Not only does Garden State make a profit from this operation so that it can survive economically, but its newsprint is cheaper than paper that printers can buy from virgin stock.

Also in New Jersey is the giant Proler Shredder, a machine that takes in junked automobiles and separates and reduces the component materials, so that what comes out are fist-sized nuggets of steel, zinc, aluminum, and copper. These metals then can be melted and reused.

The 10,000 residents of Franklin, Ohio, are served by a new plant that disposes of their municipal wastes by recycling them back into reusable states as glass, metal, and paper-making fibers. The plant handles 150 tons of refuse a day. Preliminary separation of materials is done mechanically. Then, the materials go through what is known as a "Hydraposal/Fibreclaim" process. The refuse is fed into a water-filled pulping vessel. Paper and cardboard are reduced to component fibers while rotos compact metals and pound glass into uniform particles. The glass-rich waste is further broken down by an optical sorter that divides glass by color. However, there still are problems with the Franklin operation, not so much technological as economic. The Black Clawson Company which operates the plant still has difficulty finding a market for the recycled materials and the operation does not yet pay for itself.

In St. Louis, a demonstration plant is taking garbage, mixing it with coal, and burning it, converting the energy from the organic wastes into useful heat. Three hundred tons of shredded refuse a day go into the plant to help produce the heat which makes steam which drives a generator which makes electricity.

In Sweden, discarded tires are being recycled and used in combination with hot asphalt in the laying of roads. In Berlin and Japan, waste glass is recycled into construction blocks for use in new buildings.

At the University of Wisconsin, the new scientific technology of cryogenics -- superfreezing -- is being employed to experiment with still another form of recycling. This cryogenic recycler freezes auto tires and transmission cables, then pounds the brittle material to dust in a hammermill. The recycled rubber has been used in roads by local contractors.

Far less time and imagination have gone into trying to reuse recycled things, and this deficiency is reflected in the present poor economic outlook for so many recycled products. The markets simply do not exist, yet. This economic fact of life generates pressure for the status quo. This situation is reinforced by such practices as giving tax breaks to the users of virgin materials and charging higher freight rates for recyclable wastes. Furthermore, heavy initial costs in capital investment are required in order to switch to new types of equipment needed to process used materials.

Opposed to these considerable economic obstacles is the ever more insistent need to make far more efficient use of our remaining resources, and, at the same time, to reduce the mountains of waste that threaten to engulf us.

Decision time is here.

What can I do?

Action to promote recycling can take place at a number of levels. The citizen can encourage recycling by seeking out and using recycled products or products with recycled materials, by supporting groups and companies that use recycled materials. You can have your personal and/or business stationery printed on completely recycled paper. Patronize centers that deal in returnable bottles. Speak to the manager of your supermarket about returning to returnables. Do not give your business to concerns that use throwaways. Write your legislators to follow the example of the State of Oregon, which banned the use of throwaway containers. The legislatures of 37 other states are considering similar bans; find out if such a bill is pending in your state, urge your representative to vote for it. Remember, reusing a bottle is far more economical -- in terms of money and energy -- than even recycling, which, of course, offers similar advantages over the senseless practice of dealing in nonreturnables -- not senseless, you understand, for the manufacturers and the supermarkets that enjoy profits while all the taxpayers foot the bill for the cleanup. (This raises an interesting question in political philosophy. Does a company's loyalty to its stockholders transcend its responsibility as a corporate citizen to the nation, or should a corporation refrain from maximizing profits at the direct expense of society?) Similarly, the new aluminum container is far more costly in terms of the energy expended for smelting and steady depletion of virgin resources compared to perpetual reuse of the durable metal.

Remember, also, that the concept of recycling no longer is a mystery to most citizens. Not only is the principle widely recognized, but it is popularly supported. A survey of metropolitan housewives for the Environmental Protection Agency showed that housewives believe that they can participate in reducing solid waste. Ninety percent of the housewives interviewed said they are willing to separate their trash in order to aid recycling. About half of these women believed that such a practice should be mandatory, not voluntary.

The problem appears to be the absence or shortage of coherent efforts to put these impulses into action. There is little knowledge about what recycling efforts -- if any -- are taking place locally. So two of the things needed in many communities is organization for recycling and publicity of ongoing efforts. Both can be undertaken with the knowledge that there is a foundation of community sympathy for such undertakings. A voluntary citizen recycling campaign in Greenwich, Connecticut, made such a contribution that it began to save taxpayers money...and that kind of contribution is a civic philanthropy that everyone applauds. The State of Connecticut has taken the lead in the nation in creating a Solid Waste Authority with a mandate to build a statewide system

to gather and make use of the 10,000 tons of trash that accumulate in Connecticut each day. Should your state do less?

Environmental groups can follow closely proposed legislation on the Federal, state, and municipal levels and educate members in prompting support for those measures which promote the recycling of resources.

Governments can (and you can help encourage them to) adopt procurement policies which promote the use of recycled materials and limit the use of virgin materials; remove the disparate freight rates which favor producers of virgin materials and hamper users of recycled materials; reduce or eliminate depletion allowances, capital gains tax provisions, and amortization schedules which subsidize the extraction and use of virgin resources.

The Environmental Protection Agency has funded six major projects to recover wealth from solid waste -- prod your community to consider these demonstration models. A power-generating plant in St. Louis burns garbage along with coal to provide municipal energy. This experiment has been successful enough to encourage New York City to put faith in it as one solution to its own mammoth trash problem. There is the Franklin, Ohio, recovery from wet pulping which was also covered in the broadcast. There is compost operation in Delaware; incinerator residue recovery in Lowell, Massachusetts; gas production through pyrolysis, or burning in the absence of oxygen, at Baltimore; and the recovery of oil through pyrolysis at San Diego. The EPA also is enthusiastic about economies brought about by the simple, nontechnological program in Madison, Wisconsin whereby citizens separate newspapers from the rest of their trash. The papers go on special racks on collection trucks, and then are sold.

Industrial concerns must reorient their thinking toward greater use of recycled materials -- and you in your powerful role(s) as consumer, customer, stockholder can help influence that thinking. Time and again, manufacturers have made the pleasant discovery -- often only after being forced by government edict to curb some pollution -- that recovery of valuable resources from waste can make an agreeable contribution to the black side of the ledger.

For further information

Books

1. THE CLOSING CIRCLE by Barry Commoner; Knopf, N.Y., 1971, \$6.95.

2. ONLY ONE EARTH by Barbara Ward and René Dubos; Norton, N.Y., 1972, \$6. This environmental report for the Stockholm Conference includes a section on the solid waste problem.
3. EFFECTIVE TECHNOLOGY FOR RECYCLING METAL by the National Association of Secondary Materials Industries. A report on new technology and research efforts being undertaken in the recycling field, based on research by NASMI, the Bureau of Mines and others, \$7.50.

Magazines

1. ENVIRONMENTAL SCIENCE AND TECHNOLOGY, published by the American Chemical Society, 1155 16th St., N.W., Washington, D.C. 20036. This magazine frequently discusses technological aspects of recycling.
2. PHOENIX QUARTERLY, published by The Institute of Scrap Iron and Steel, Inc. (See Organizations.)

Publications

1. REPORT TO CONGRESS ON RESOURCE RECOVERY by the Environmental Protection Agency Feb. 22, 1973. The report summarizes the EPA's investigations on resource recovery, and covers such areas as paper recycling, ferrous metals recycling, non-ferrous metals recycling, glass recycling, plastics recycling, textiles recycling, resource recovery installations.
2. RESOURCE RECOVERY: THE STATE OF TECHNOLOGY, prepared for the Council on Environmental Quality by Midwest Research Institute, Feb., 1973, U.S. Government Printing Office, Washington, D.C. 20402, 95 cents. This report evaluates 40 technologically feasible methods for recovering resources from mixed municipal waste. Only two methods are fully developed and practiced, heat recovery from incinerators and composting, but other technologies are coming close to practical realization - energy recovery processes, materials recovery processes, pyrolysis processes, chemical conversion processes.
3. RECYCLING: A GUIDE TO EFFECTIVE SOLID WASTE UTILIZATION by National Association of Secondary Materials Industries, 1972. A concise summary of the state of industrial recycling in the United States.

4. RECYCLING: ASSESSMENT AND PROSPECTS FOR SUCCESS by Arsen Darnay, Environmental Protection Agency, 1972; available from U.S. Government Printing Office, Washington, D.C. 20402.
5. SOLID WASTE DEMONSTRATION PROJECTS? Proceedings of a Symposium held in Cincinnati May 4-6, 1971, Environmental Protection Agency (SW-4p); available from U.S. Government Printing Office, Washington, D.C. 20402, \$1.50.
6. METROPOLITAN HOUSEWIVES' ATTITUDES TOWARD SOLID WASTE DISPOSAL, prepared for the Environmental Protection Agency by National Analysts, Inc. of Philadelphia, Penna. Available from Environmental Protection Agency, National Environmental Research Center, Cincinnati, Ohio 45268 or U.S. Government Printing Office, Washington, D.C. 20402. Among the findings: that metropolitan housewives believe that they can help in reducing solid waste by taking part in recycling efforts and 90 percent of those questioned expressed willingness to separate their trash to facilitate recycling.
7. THE ECONOMICS OF RECYCLING WASTE MATERIALS. Hearings before the Subcommittee on Fiscal Policy of the Joint Congressional Economic Committee, Nov. 8 and 9, 1971; U.S. Government Printing Office, Washington, D.C. 20402, 75 cents.
8. A STUDY TO IDENTIFY OPPORTUNITIES FOR INCREASING SOLID WASTE UTILIZATION, published by National Association of Secondary Materials Industries. A massive study commissioned by the Environmental Protection Agency with research by Batelle Institute. It deals with all aspects of the solid waste problem expounded in three volumes: General, Nonferrous Metals, and Paper-Textile.
9. RECOVERY AND UTILIZATION OF MUNICIPAL SOLID WASTE, for the Office of Solid Waste Management, Environmental Protection Agency by N.L. Drobny, H.E. Hull, and R.F. Testin of Batelle Institute, Columbia Laboratories, 1971; available from U.S. Government Printing Office, Washington, D.C. 20402, \$1.75.
10. COMPOSTING OF MUNICIPAL SOLID WASTES IN THE UNITED STATES, Environmental Protection Agency (SW-47r), 1971; available from U.S. Government Printing Office, Washington, D.C. 20402, \$1.
11. RECYCLE: IN SEARCH OF NEW POLICIES FOR RESOURCE RECOVERY by League of Women Voters, 1730 M St., N.W., Washington, D.C. 20036, 1972, 75 cents.

12. WEALTH OUT OF WASTE, published by Bureau of Mines on its program on solid waste utilization.
13. A VITAL INDUSTRY by the Paper Stock Institute of America, a division of National Association of Secondary Materials Industries, on paper recycling.
14. POLLUTION FACTS: RETURNABLES vs NON-RETURNABLES by the Community and Regional Development Group, Chamber of Commerce of the U.S., 1971.
15. LITTER, SOLID WASTE AND ALUMINUM RECYCLING: QUESTIONS AND ANSWERS by The Aluminum Association.
16. GUIDELINES FOR EFFECTIVE RECYCLING by National Association of Secondary Materials Industries, 1972; a pamphlet explaining goals of recycling for youngsters, \$5 for 100.

Articles

1. "What to Do With Waste: Use It Over and Over and Over Again" by LaMont C. Cole, THE NEW YORK TIMES MAGAZINE, April 2, 1972.
2. "Bottles, Cans, Energy" by Bruce M. Hannon in ENVIRONMENT, March 1972. Returnable bottles are cheaper in dollars and scarce energy resources than throwaways even when the best recycling technology is used.
3. "Solid Wastes: Can We Stem The Rising Tide?" in CF LETTER, April 1973, The Conservation Foundation.
4. "The Land Pinch: Where Can We Put Our Wastes?" in CF LETTER, May 1973, The Conservation Foundation.
5. "Garbage-Smothered Cities Face Crisis in Five Years" by Bill Kovach, THE NEW YORK TIMES, June 10, 1972.
6. "Garbage: Where Does It All Go?" NEWSWEEK, Dec. 25, 1972.
7. "Recycling: Answer to Our Garbage Predicament?" READER'S DIGEST, March 1972.
8. "Salad Days in Garbage," TIME, Nov. 20, 1972.
9. "Severe Shortage of Ores Is Feared" by Harold Schmeck, Jr., THE NEW YORK TIMES, May 9, 1973.
10. "Aluminum Industry Offers Process to Recycle Waste" by David Bird, THE NEW YORK TIMES, Jan. 26, 1971.

11. "City To Buy Only Recycled Paper," THE NEW YORK TIMES, Nov. 15, 1972.
12. "City Re-examines Waste Disposal," THE NEW YORK TIMES, Oct. 22, 1972.
13. "Lindsay Says Government Hampers Waste Recycling" by David Bird, THE NEW YORK TIMES, Feb. 3, 1971.
14. "Recycling of Waste Discounted Here," THE NEW YORK TIMES, Feb. 11, 1973.
15. "Can Solid Waste Turn a Profit?" THE NEW YORK TIMES, Oct. 1, 1972.
16. "Power from Waste Disposal" by Gene Smith, THE NEW YORK TIMES, Mar. 5, 1972. On a system by Combustion Equipment Associations, Inc. on how to burn garbage for power, including plastics and controlling pollution at the same time.
17. "Waste Recycling Makes Progress, Community Groups Try To Stem The Deluge," THE NEW YORK TIMES, Jan. 23, 1972. Reports on recycling efforts that have shown promise in Franklin, Ohio; Portland, Oregon; Denver; Los Angeles.
18. "Bottle Deposits Upheld in Bowie, Maryland," THE NEW YORK TIMES, Jan. 2, 1972. A judge upholds a city ban on non-returnable bottles, believed the first in nation, which also requires deposit on all beverage containers.
19. "Shredders Slowly Reducing Heaps of Junked Cars" by Robert Lindsey, THE NEW YORK TIMES, Mar. 26, 1972.
20. "The Value of Sludge," TIME, Sept. 27, 1971.
21. "The Rise of 'Rejasing'," TIMES, April 19, 1971. Rejasing is an acronym for reusing junk as something else.

Films*

1. THE REALITIES OF RECYCLING, 38 min., color, Stuart Finley, \$300, rental \$30, produced in 1971. In Madison, Wisconsin, citizens are recycling newspapers; in San Diego, they bring in cans for reprocessing; but the film also points out that recycling technology is often too expensive for individuals or small groups to undertake. Jr. high school to adult.

*Addresses of film distributors are given at the end of this guide.

2. RECYCLING, 21 min., color, Stuart Finley, \$200, rental \$20, produced in 1971. This film, sponsored by the Bureau of Solid Waste Management, shows ways that can be taken to recycle, if the choices were made to do so. Jr. high school to adult.
3. WEALTH OF THE WASTELAND, 27 min., color, free loan from Bureau of Mines, produced in 1968. Workmanlike presentation on solid waste recycling. Jr. high school to adult.
4. CYCLES, 13 1/2 min., color, free loan from Association-Sterling Films, produced in 1972. Theme of film: technology exists for sorting solid wastes and it must be used. Scene of experimental plant sponsored by Bureau of Land Management. Jr. high school to adult.
5. ECOLOGY LADY, 11 min., color, Stuart Finley, \$150, rental \$15, produced in 1971. A film about Mary Karraker who organized a volunteer recycling center in Fairfax County, Virginia. Jr. high school to adult.
6. A FUNNY THING HAPPENED ON THE WAY TO THE GARBAGE DUMP, 50 min., b & w, Time-Life Films, \$300, rental \$30, produced in 1970. The funny thing is that the refuse became resources and the waste became commercially marketable products.
7. THE GREAT ALL-AMERICAN TRASH CAN? 13 min., color, free loan from Commonwealth Film Distributors, produced in 1971. Shows some things glass can be made into after you are through with the bottle. Jr. high school to adult.
8. PEOPLE WHO FIGHT POLLUTION, 18 min., color, Churchill Films, \$210, produced in 1971. Shows glass recycling and useful objects discarded in trash as part of film on solid waste disposal. Jr. high school to adult.
9. STEEL -- THE RECYCLED MATERIAL, 10 min., color, free loan from Association-Sterling Films, produced in 1972. Jr. high school to adult.
10. RECYCLING ATLANTA, 3 min., color, free loan from Ruder & Finn, Inc., 110 East 59th St., New York, N.Y. 10022, produced in 1971. Film shows recycling system by which iron is separated out of Atlanta's refuse and resold. Jr. high school to adult.
11. RECYCLING SAN FRANCISCO, 3 min., color, free loan from Ruder & Finn, Inc., produced in 1971. Film shows an incipient complete recycling center. Jr. high school to adult.

12. UNCLE SMILEY GOES RECYCLING, 13 min., color, Learning Corporation of America, \$165, rental \$15, produced in 1972. For children to age 12.
13. RECYCLING RESOURCES, a 35 mm, color filmstrip with phonographic record commentary on effectiveness of recycling in meeting the solid waste problem. May be purchased from National Association of Secondary Materials Institute. A special version of this filmstrip is available for elementary school levels.

Organizations

1. National Association of Secondary Materials Industries, Inc.
330 Madison Avenue
New York, N.Y. 10017
(This trade organization provides an information service on virtually all aspects of solid waste recycling:
(212) 867-7330.)
2. The Institute of Scrap Iron and Steel, Inc.
1729 M St., N.W.
Washington, D.C. 20006
3. American Iron and Steel Institute
150 East 42 St.
New York, N.Y. 10017
4. Glass Container Manufacturers Institute
330 Madison Avenue
New York, N.Y. 10017
5. Aluminum Association
750 Third Avenue
New York, N.Y. 10017
6. National Center for Solid Waste Disposal, Inc.
1211 Connecticut Avenue, N.W.
Washington, D.C. 20036
7. Can Manufacturers Institute Inc.
821 15th St., N.W.
Washington, D.C. 20005
8. Recycling Council of Greater New York
P.O. Box 628
Cathedral Station, N.Y. 10025
9. National Soft Drink Association
1101 16th St., N.W.
Washington, D.C. 20036

10. Carbonated Beverage Manufacturer's Association
707 Investment Building
Washington, D.C. 20005
11. U.S. Brewer's Association
1750 K St., N.W.
Washington, D.C. 20006
12. National Center for Resource Recovery, Inc.
(A nonprofit organization supported by industry and labor to bring together the technology to solve solid waste problems.)

Government Agencies

1. Office of Solid Waste Management
Environmental Protection Agency
Waterside Mall
5600 Fishers Lane
Rockville, Md. 20852
2. Bureau of Solid Waste Management
Environmental Control Administration
12720 Twinbrook Parkway
Rockville, Md. 20852
(Sponsors research on solid waste disposal; provides information and suggests scientists and facilities for consultation.)
3. Bureau of Mines
Department of the Interior
18th and C Sts., N.W.
Washington, D.C. 20240
(The Bureau is concerned with the conservation, and thus recycling, of minerals; in addition to general queries to the Bureau, information on mineral conservation may be sought from the Bureau's Office of Mineral Resource Development; queries on information on minerals statistics should be directed to the Office of Mineral Information.)
4. Solid Waste Information Retrieval
Office of Solid Waste Management
Environmental Protection Agency
5600 Fishers Lane
Rockville, Md. 20852
(Stores for ready access information about current research and technology for solid waste disposal throughout the world.)
5. New York State Council of Environmental Advisors
1841 Broadway
New York, N.Y. 10023
(Coordinates county cleanup and recycling campaigns throughout the State.)

Film Distributors

For an extensive list of environmental films:

THE ENVIRONMENTAL FILM Review, A Critical Guide to Ecology Films, published yearly by

Environment Information Center, Inc.
Film Reference Department
124 E. 39th St.
New York, N.Y. 10016

DIRECTORY OF ENVIRONMENTAL INFORMATION SOURCES
(Published by)

The National Foundation For Environmental Control, Inc.
151 Tremont St.
Boston, Mass. 02111

1. ACI Films, Inc. 35 W. 45th St., New York, N.Y. 10024
2. Arthur Barr Productions, P.O. Box 7-C, Pasadena, Calif. 91104
3. Association-Sterling Films, 600 Grand Ave., Ridgefield, N.J. 07657
4. Atomic Energy Commission, Division of Public Information, Washington, D.C. 20545
5. BFA Educational Media or Bailey-Film Associates, 2211 Michigan Ave., Santa Monica, Calif. 90404
6. Boyd Film Company, 1569 Selby Ave., St. Paul, Minn. 55104
7. Bureau of Mines, Motion Pictures, 4800 Forbes Ave., Pittsburgh, Pa. 15213
8. Capital Film Laboratories, 470 East St. SW, Washington, D.C. 20024
9. Carousel Films, 1501 Broadway, New York, N.Y. 10036
10. CCM Films, Inc., 866 3rd Ave., New York, N.Y. 10022
11. Centron Educational Films, 1621 West 9th St., Lawrence, Kans. 66044
12. Churchill Films, 662 N. Robertson Blvd., Los Angeles, Calif. 90069

13. Commonwealth Film Distributors, 1440 S. State College Blvd.,
Bldg. 6-K, Anaheim, Calif. 92806
14. Contemporary Films/McGraw-Hill, 327 West 41st St., New York,
N.Y. 10036
15. Coronet Instructional Materials, 65 East South Water St.,
Chicago, Ill. 60601
16. Encyclopedia Britannica Educational Corporation, 425 North
Michigan Ave., Chicago, Ill. 60611
17. Enterprise Productions, Inc., 1019 Belmont Place East,
Seattle, Wash. 98102
18. Film Images, 17 West 60th St., New York, N.Y. 10023
19. Film Management Center, Denver Federal Center, Building 67,
Denver, Colo. 80225
20. Films Inc., 1144 Wilmette Ave., Wilmette, Ill. 60091
21. Florida State University, Educational Media Center,
Tallahassee, Fla. 32306
22. Fordham Publishing Company, 2377 Hoffman St., Bronx, N.Y.
10458
23. Holt, Rinehart & Winston, 383 Madison Ave., New York, N.Y.
10017
24. Indiana University, Audio-Visual Center, Bloomington, Ind.
47401
25. International Film Bureau, 332 South Michigan Ave., Chicago,
Ill. 60604
26. Kent State University, Audio-Visual Services, Kent, Ohio
44240
27. King Screen Productions, 320 Aurora Ave. North, Seattle,
Wash. 98109
28. Learning Corporation of America, 711 Fifth Ave., New York,
N.Y. 10022
29. Mass Media Ministries, 2116 North Charles St., Baltimore,
Md. 21218
30. Media for Urban Environment, 75 Frost St., Brooklyn, N.Y.
10019
31. Michigan State University, Instructional Media Center,
East Lansing, Mich. 48823

32. Modern Talking Picture Service, 315 Springfield Ave.,
Summit, N.J. 07901
33. National Broadcasting Company, 30 Rockefeller Plaza,
New York, N.Y.
34. National Film Board of Canada, 680 Fifth Ave., New York,
N.Y. 10019
35. New York University, Film Library, 26 Washington Plaza,
New York, N.Y. 10003
36. Ohio Department of Natural Resources, Division of Wildlife,
Film Library, 1500 Dublin Road, Columbia, Ohio 43212
37. Perennial Education, Inc., 1825 Willow Road, Northfield,
Ill. 60093
38. Pennsylvania State University, Audio-Visual Services,
6 Willard Bldg., University Park, Pa. 16802
39. Pictura Films Distribution Corp., 43 W. 16th St., New
York, N.Y. 10011
40. Planned Parenthood/World Population, 810 Seventh Ave.,
New York, N.Y. 10003
41. Portland Cement Association, Old Orchard Road, Skokie,
Ill. 60076
42. Pyramid Films, Box 1048, Santa Monica, Calif. 90406
43. Roa's Films, 1696 North Astor St., Milwaukee, Wis. 53202
44. Scott Foresman and Co., Film Distribution Center, 305 East
45th St., New York, N.Y. 10017
45. State University of New York, Film Library, College of
Forestry, Syracuse, N.Y. 13210
46. Sterling Educational Films, 241 East 34th St., New York,
N.Y. 10016
47. Stuart Finley, Inc., Dept. R, 3428 Mansfield Road, Falls
Church, Virginia 22041
48. Texture Films Inc., 1600 Broadway, New York, N.Y. 10019
49. Time-Life Films, 43 West 16th St., New York, N.Y. 10011
50. United Productions of America, 488 Madison Ave., New York,
N.Y. 10022

51. University of Arizona, Bureau of Audio-Visual Services,
Tuscon, Ariz. 85721
52. University of California, Extension Media Center,
Berkeley, Calif. 94720
53. University of Michigan, A-V Education Center, 416 Fourth
St., Ann Arbor, Mich. 48103
54. University of Minnesota, Department of A-V Extension,
2037 University Avenue SE, Minneapolis, Minn. 55455
55. University of Southern California, Film Distribution
Section, University Pl., Los Angeles, Calif. 90007
56. Xerox Films, Stamford, Conn. 06904